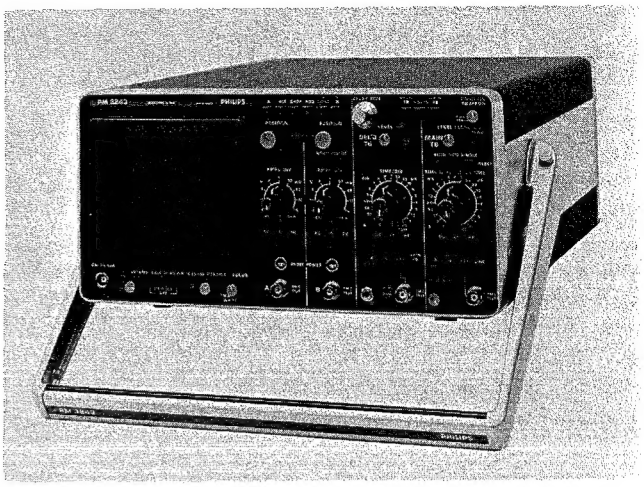
PHILIPS



Portable 50MHz storage multiplier oscilloscope

PM3243

Order number of
this insert 9499 440 17102

770425/1/01-03

Service data

Contents

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3.1. DESCRIPTION OF THE BLOCK DIAGRAM

Refer to Fig. 2.10

General information

The PM 3243 oscilloscope comprises the following parts:

- a dual-channel vertical deflection system with signal multiplication facility
- a main time-base
- a delayed time-base
- a switching unit
- an X amplifier
- a Z modulator and c.r.t. circuit with persistence storage facilities
- e.h.t. supplies
- a power supply

Dual-channel vertical deflection system

The A and B vertical channels are almost identical circuits. The main differences are that channel B has a switch facility for signal inversion, and in the multiplier mode the signal is routed via the A channel after multiplication
The input signal to each channel is fed via a three-position coupling switch AC/0/DC to the input attenuator. In the AC position a capacitor is switched in series with the signal path. In the 0 position the input signal path is interrupted and the attenuator input is earthed.
The input attenuator, controlled by the AMPL/DIV switch via reed relays, enables the adjustment of the vertical deflection sensitivity in calibrated steps. This attenuator consists of a high and low impedance part separated by an impedance converter, with a drift-compensation circuit.
The d.c. balance of the entire channel is set by a BAL potentiometer which compensates for the d.c. offset voltage of the impedance converter.
The output signal of the attenuator is applied via a 50 Ohm coaxial cable to the intermediate amplifier where it is transformed into push-pull signal.
The intermediate amplifier provides the following functions:

- a signal for the trigger pre-amplifier
- GAIN calibration and BAL compensation controls
- shift for the Y trace by means of the POSITION control combined with 0 x A and 0 x B compensation controls
- electronic switching of the selected channel modes
- phase inversion of the B channel by means of the INVERT pushbutton.

The channel selector enables or inhibits the Y signals as dictated by the channel selection logic. In the A, B, ADD and MULT modes, the channel selector logic setting depends on the vertical display mode switch. In the ALT mode the channel selector logic is controlled by pulses derived from the sweep-gating multivibrator of the main time-base generator. In this way, the complete signal trace of channel A and channel B are alternately displayed on the c.r.t. screen.

In the CHOP mode, the channel selector control pulses are derived from an oscillator running at a fixed frequency of approximately 1 MHz. These pulses successively open and close the electronic switch in the channel selector so that portions of the signals of channel A and channel B are alternately and repetitively displayed.

In the MULT mode, the signals to be multiplied are taken out of the amplifier stages of channels A and B and are multiplied in the multiplier circuit. The resulting signal is amplified and re-inserted in the amplifier of channel A. If MULT and B pushbutton are simultaneously depressed, both signals are displayed in the CHOP mode.

A common output for the A and B channels feeds the delay line, which delays the vertical signals sufficiently to permit the steep leading edges of fast signals to be displayed. A delay-line correction circuit compensates for the distortion introduced by the delay line. A final stage feeds the Y signals to the vertical deflection plates of the c.r.t.

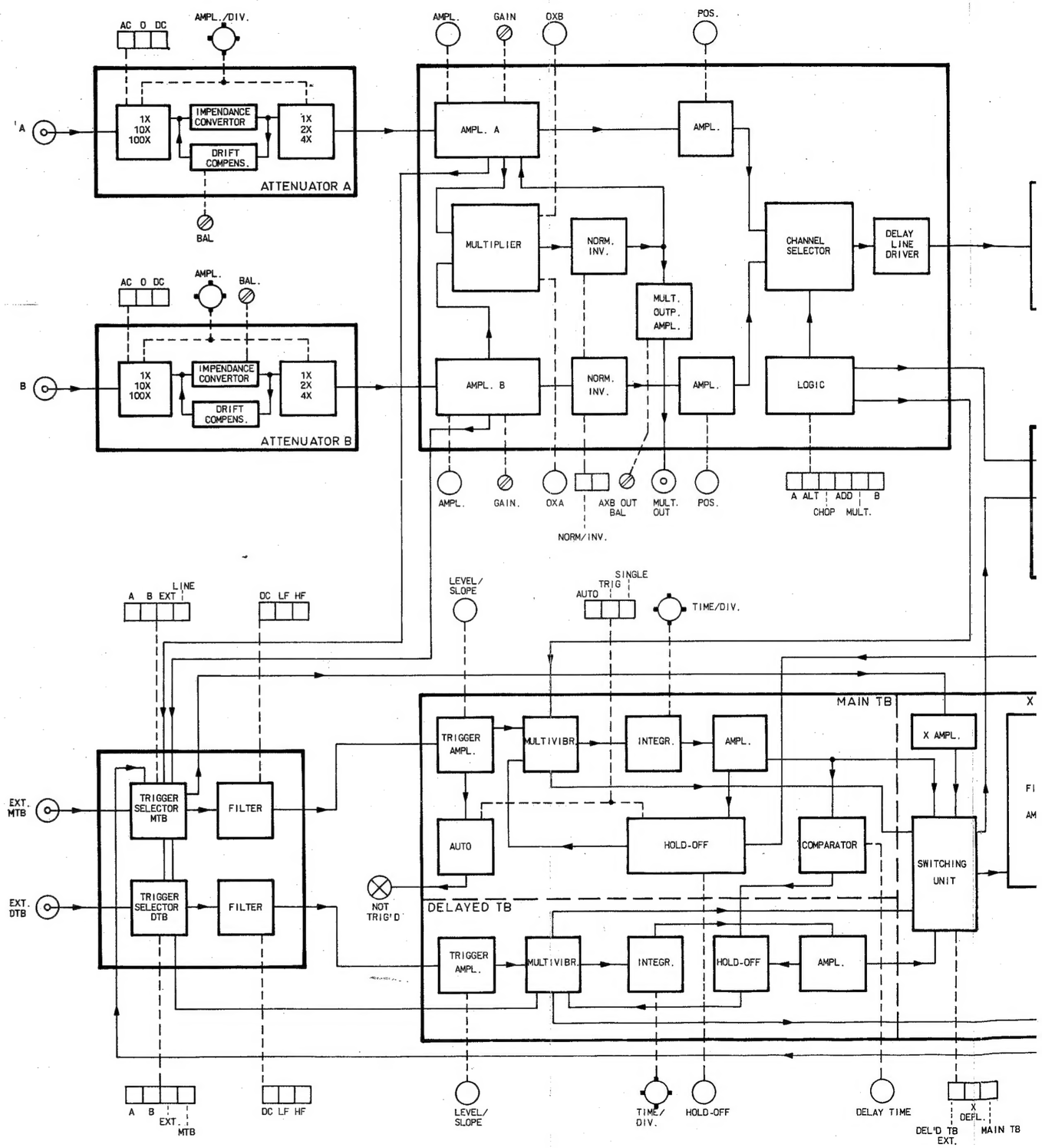
Time-bases

Main time-base

The trigger source/X deflection selector receives its signal from one of four sources:

- either A or B vertical channels via its trigger amplifier
- from the EXT input socket
- from the opto-isolator in the power supply.

Selection of these sources is by means of the four-pushbutton unit in this stage.



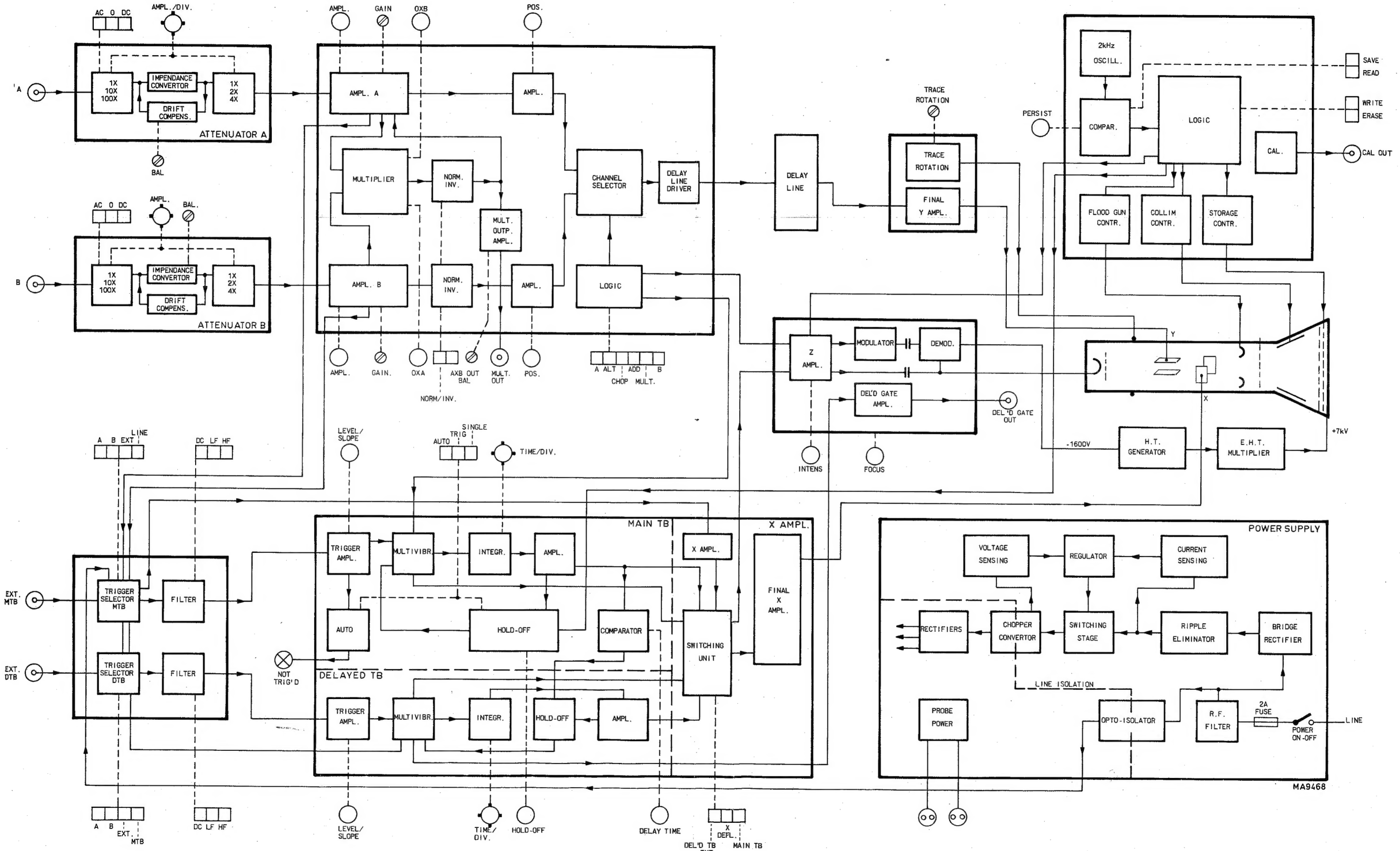


Fig. 3.1. PM 3243 block diagram

From the selector stage, the signal is fed to either the X pre-amplifier for horizontal deflection (when external X signal is employed), or the trigger amplifier for starting the time-base generator. The input of the trigger differential amplifier stage contains the control for selecting the input frequency range of the trigger circuit.
The trigger LEVEL adjustment and SLOPE selection switch are also incorporated in this stage. The SLOPE selector switches the differential amplifier to invert the polarity of the trigger signal to enable triggering of the input signals on either positive or negative-going slopes.
The output of the trigger amplifier is applied to the trigger multivibrator, which produces well-defined trigger pulses. These trigger pulses are used to switch the sweep-gating multivibrator and, when the AUTO pushbutton has been selected, for driving the auto-circuit.

The sweep-gating multivibrator controls the starting and stopping of the integrator circuit that produces the sawtooth waveform required for the horizontal deflection.
The integrator circuit consists of charging capacitors switched by transistors, and the resistors selected by the TIME/DIV switch to set the time coefficients in calibrated steps. Continuous control of these time coefficients is obtained by varying the charging current of the time-determining capacitors by means of the TIME/DIV potentiometer.
The resulting sawtooth signal of the integrator is fed to the X deflection selector, the hold-off multivibrator and the comparator, which is part of the delayed time-base unit.
The hold-off multivibrator resets the sweep-gating multivibrator and inhibits its input during the flyback period of the sawtooth waveform. The hold-off circuit also incorporates the single sweep circuit that causes the main time-base to produce a single sawtooth waveform after the SINGLE pushbutton has been depressed and on receipt of a trigger pulse.

The automatic free-run circuit or auto-circuit makes the time-base free-running when no trigger pulses are applied.

Delayed time-base

If the MAIN TB of the horizontal display switched is depressed, and the delayed time-base TIME/DIV knob is not in the OFF position, part of the main time-base sweep line is displayed at higher intensity.
In this way, part of the displayed signal can be selected for more detailed observation. The selected part of the signal is displayed over the whole screeen by pressing the DELD'D TB switch.
The sweep time of the intensified part of the main time-base sweep depends on the delayed time-base TIME/DIV knob.
With the centre knob, sweep times between the steps can be adjusted. For time measurements this knob must always be in the CAL position.

The starting time of the delayed time-base is determined by the settings of the main time-base TIME/DIV OR DELAY TIME knob and the DELAY TIME 10-turn multiplier knob.

If the MAIN TB trigger selector switch of the delayed time-base is pressed, the delay time after which the delayed time-base is started, is the product of the main time-base TIME/DIV switch setting and the DELAY TIME multiplier knob.

If instead of MAIN TB, the delayed time-base is triggered by A, B or EXT , the delayed time-base will start after this delay-time and upon receipt of a trigger pulse.

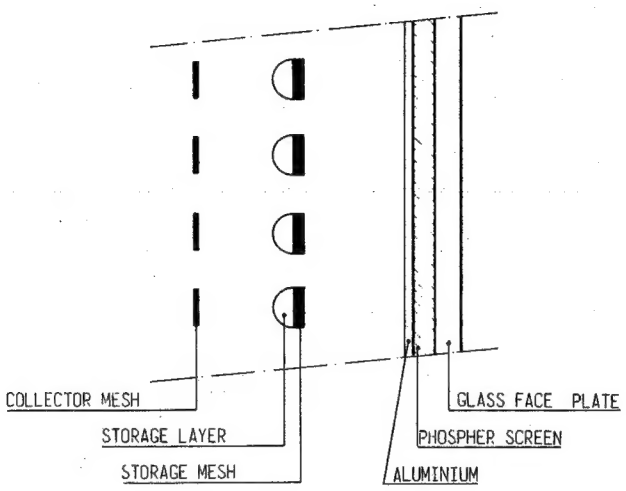
In principle, the delayed trigger-unit and time-base generator use similar circuits to those of the main trigger-unit and time-base generator. The delayed time-base always operates in the single-shot mode. The sweep is initiated by the main time-base generator which also serves as hold-off for the delayed time-base.

The DELAY TIME control in conjunction with the comparator and reset multivibrator determine the delay time for the delayed time-base generator. The delayed time-base is operative unless its TIME/DIV control is in the OFF position. It starts immediately after the delay time, or upon receipt of the first trigger pulse after the delay time. It can be triggered by the A, or B channels, or externally.
When pushbutton MAIN TB of the horizontal deflection mode controls is depressed, the part of the trace coinciding with the delayed sweep is intensified.

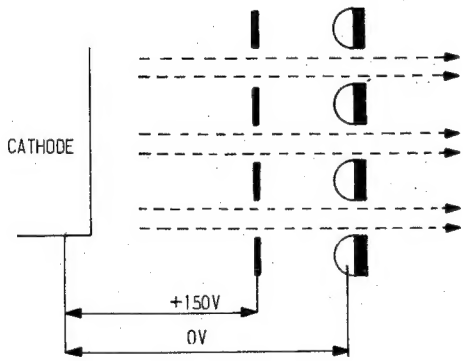
Switching unit and X amplifier

The X deflection selector couples the external X deflection signal from the X (pre)amplifier, the output of the main time-base generator or the output of the delayed time-base generator to the X amplifier, which feeds the horizontal deflection plates. The X amplifier comprises the horizontal trace positioning and the x5 magnification controls.

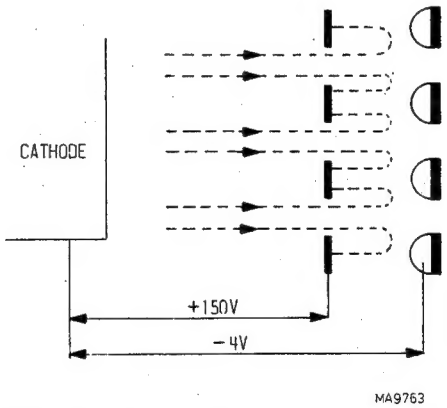
The storage-mesh may be compared to the grid of a triode. Just as the triode grid potential controls the anode current, the storage mesh controls the current of flood-gun electrons to the display phosphor.
If the var. persistance/storage functions are not operative the memory mesh is on a constant −36 V level.
The writing gun electrons fly through both meshes and reach the display phosphor. The flood-gun electrons are not getting through the memory mesh but are retracted by the collector mesh.



3.3.a. Detail of storage system



3.3.b. Full brightness storage



3.3.c. Storage cut-off

Fig. 3.3. Storage system details

3.2. STORAGE TUBE

Storage principle

The information is stored by writing the signal of the main electron beam into a STORAGE LAYER of non-conductive material. As a result of the secundary emission of electrons from this layer, a positive charge pattern is formed. This charge pattern on the storage surface will remain there for a considerable length of time. The trace is displayed on the phosphor viewing screen by means of two flood beams whose electrons can strike the display-phosphor via the positively charged parts on the storage layer.

Storage of information on non-conductive material is based on secundary emission. Fig. 3.2. shows the ratio between the number of electrons leaving the storage layer and the number of electrons arriving (secundary emission ratio) versus the surface potential. At a certain surface potential, V_a in Fig. 3.2. the number of electrons leaving the surface equals the number of electrons arriving. This point is called the first cross-over (secundary emission ratio = 1).

If the surface of the storage layer is hit by electrons of higher energy (electrons with greater velocity), the surface will become more positive, since more electrons are leaving than arriving. If the surface is hit by electrons of lower energy (electrons with lower velocity) than at V_a, the surface potential becomes more negative, as fewer electrons are leaving than arriving.

Construction and operation of the storage c.r.t.

The storage cathode-ray tube contains two electron-gun systems: the WRITING system and the FLOOD system. The writing electron-gun system is in principle the same as in a normal cathode ray tube.

The FLOOD system consists of a pair of FLOOD GUNS operated in parallel. Both guns comprise a CATHODE k, a CONTROL GRID g1 and an ACCELERATOR GRID g2. Common to both flood guns are the FLOOD BEAM COLLIMATORS MESH g8, the STORAGE MESH g9 which carries the storage layer , and the PHOSPHOR VIEWING SCREEN g10. Refer to Fig. 3.3 and 3.30.

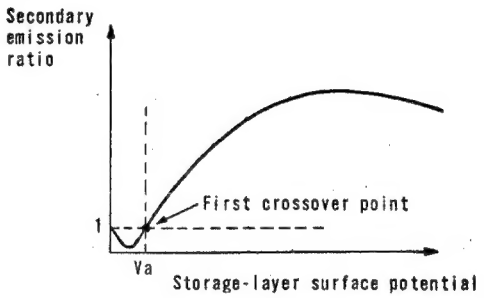


Fig. 3.2. Secondary emission ratio

The flood guns are located besides the horizontal deflection plates. The cathode potential is approx. 0 V, this being 50 V negative in relation to the accelerator grids. Both flood gun cathodes emit a cloud of electrons. These clouds are combined by both control grids g1, accelerated by both accelerator grids g2 and shaped by the collimator g7 which consists of a coating on the inner surface of the c.r.t. The positive voltage on the collimator is such that the electron cloud emanating from the flood gun just fills the viewing area of the c.r.t.

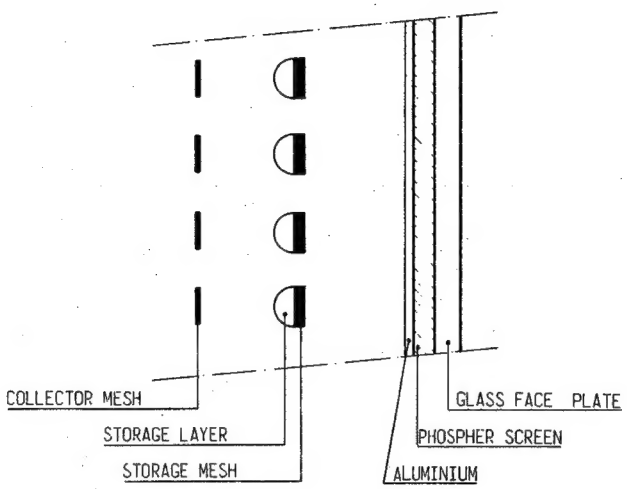
The cloud is further accelerated in the direction of the storage mesh and the display phospor g8. After passing through the collector mesh, the flood-gun electrons are controlled by the potentials on the storage layer surface.

Both meshes have been made from very thin material with 40 x 40 μm apertures. The cathode side of the storage mesh is coated with a non-conductive material on which the information is stored. In other words, there exists a capacitive coupling between the storage mesh and the storage-layer surface. The storage mesh is normally at a potential of approximately +1 V in relation to the flood-gun cathode potential, i.e. approximately +32 V with respect to earth.

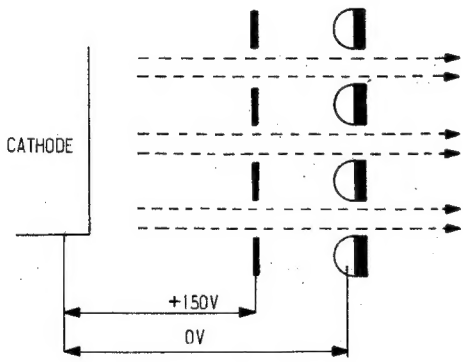
The potential V_a at the storage-layer surface is controlled by WRITE and ERASE signals which are applied to the storage mesh, and varies between 0 V positive and 8 V negative in relation to the flood-gun cathode. When the storage-layer surface is at a potential of 0 V in relation to the cathode (see Fig. 3.3.b.), the majority of flood-gun electrons pass through the holes in the mesh and reach the phosphor screen. The remaining electrons are repelled by the storage-layer surface and collected by the collector mesh. When the potential of the storage-layer surface is negative in relation to the cathode (see Fig. 3.3.c.), the number of electrons passing through the storage mesh is drastically reduced or, when the cut-off level is reached, no electrons pass at all (just black).

The post-accelerator voltage of approximately 7 kV is connected to the phosphor viewing screen. Electrons that are allowed to pass through the storage mesh are accelerated by this potential and strike the phosphor with such a velocity that a brilliant display is obtained.

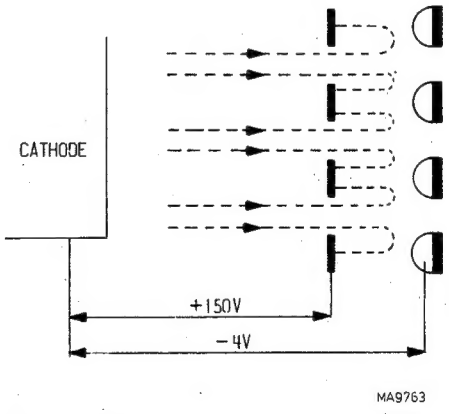
The storage-mesh may be compared to the grid of a triode. Just as the triode grid potential controls the anode current, the storage mesh controls the current of flood-gun electrons to the display phosphor.
If the var. persistance/storage functions are not operative the memory mesh is on a constant −36 V level.
The writing gun electrons fly through both meshes and reach the display phosphor. The flood-gun electrons are not getting through the memory mesh but are retracted by the collector mesh.



3.3.a. Detail of storage system



3.3.b. Full brightness storage



3.3.c. Storage cut-off

Fig. 3.3. Storage system details

3.3. CIRCUIT DESCRIPTION

Only the circuits of the PM 3243 which are additional to, or different from the basic PM 3240 oscilloscope are discussed.
For the remaining description and drawings refer to the basic PM 3240 manual.
All push-button switches in the circuit-diagrams have been drawn in the released position.

1. Variable persistence/storage

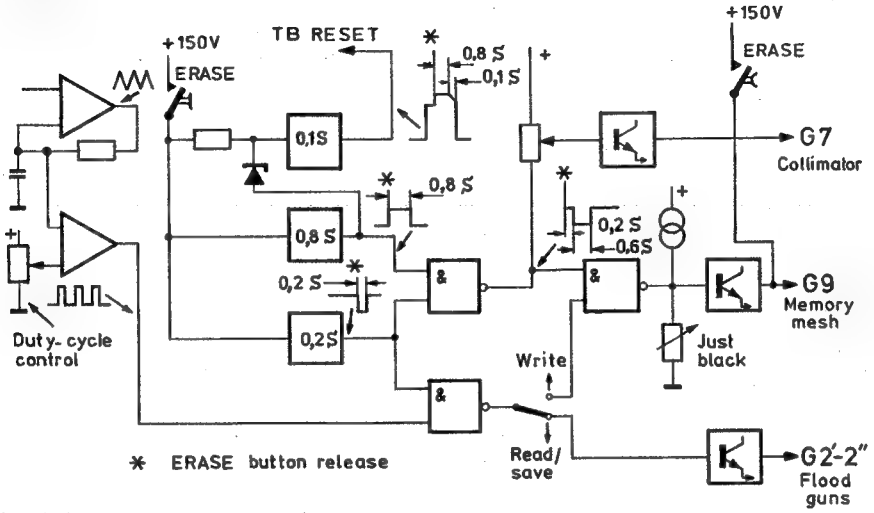


Fig. 3.4. Simplified circuit persistence/storage functions

Refer to circuit diagram Fig. 3.31.
Some wave-forms in this circuit are given in Fig. 3.32.
Fig. 3.4 shows the simplified circuit of the persistence/storage functions.

The IC 2101-A circuit forms a triangular-wave 2 kHz oscillator, which drives the variable duty-cycle generator IC 2101-B. The duty-cycle of the square-wave signal on the output of IC 2101-B depends on the PERSIST control and the position of the WRITE and SAVE switches.

a. WRITE mode

SK20-WRITE depressed.
The square-wave signal present on input 13 of IC 2102-D is applied to the emitter-folower TS 1211 via IC 1202-C.
TS 1211 feeds the memory-mesh (g9) of the cathode ray tube.
The duty-cycle of the signal on the memory-mesh depends on the PERSIST control (R15).
The voltage on the flood-gun accelerators (G2'-G2") is constant because TS 2114 is not conducting.
Z-modulation (current to R1394) is not inhibited because SK20 (10-11) is open.

b. SAVE and READ modes

The voltage on the memory-mesh is now constant because SK20 (2-3) is open.
On the flood-gun accelerators is now a square-wave voltage the duty-cycle of which controls the amount of flood-gun electrons.
Z-modulation is inhibited because R1394 is now connected to +12 V.

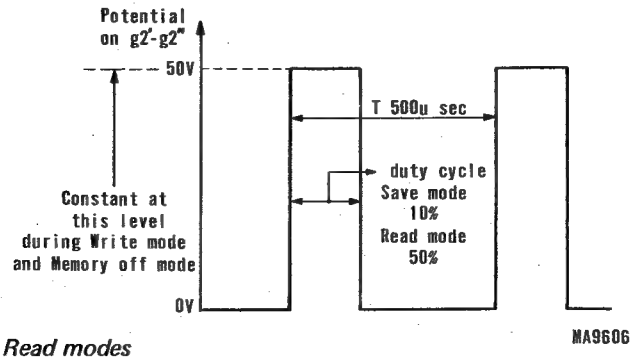


Fig. 3.5. Save and Read modes

SK20-SAVE depressed.
The duty-cycle of the flood-gun accelerator voltage is now 10% resulting in a just visible display. (This duty-cycle can be adjusted up to 50 % with preset pot. meter R2149 (SAVE) giving a brighter display but shorter store time). Factory set at 10 % for 15 min. store time.
SK20-READ depressed.
The duty cycle of the flood-gun accelerator voltage is now 50 % giving a useful display.

c. *Manual ERASE mode*

SK21-ERASE depressed (only operative in the WRITE mode).
If the ERASE button is depressed a constant +150 V voltage is applied to the memory mesh (via GR2105). Owing to the capacitive coupling between the surface layer and the mesh itself, the surface layer voltage rises the same voltage jump. By the high positive layer voltage, secondary emission takes place over the whole layer surface and all information on the storage layer is overruled.
The voltage over the whole layer surface will now reach approx. +150 V which is the potential of the collector mesh. If the local surface layer voltage would be lower the secundairy emission takes place until the voltage is reached.
The local surface layer voltage can not grow higher than +150 V because then the secundary emission electrons are then reflected by the collector mesh.
At the moment the ERASE button is released the surface layer voltage jumps approx. 150 V due to the capacitive coupling.

After a stable situation of approx. 200 ms, a +8 V pulse of approx. 600 ms is applied to the storage mesh. The surface layer which follows capacitively will now be sprayed by low-energy electron which do not cause secondairy emission but will bring the surface to a sufficient low voltage.
At the end of the 600 ms pulse the mesh voltage jumps 8 V which will bring the surface layer at approx. −8 V.

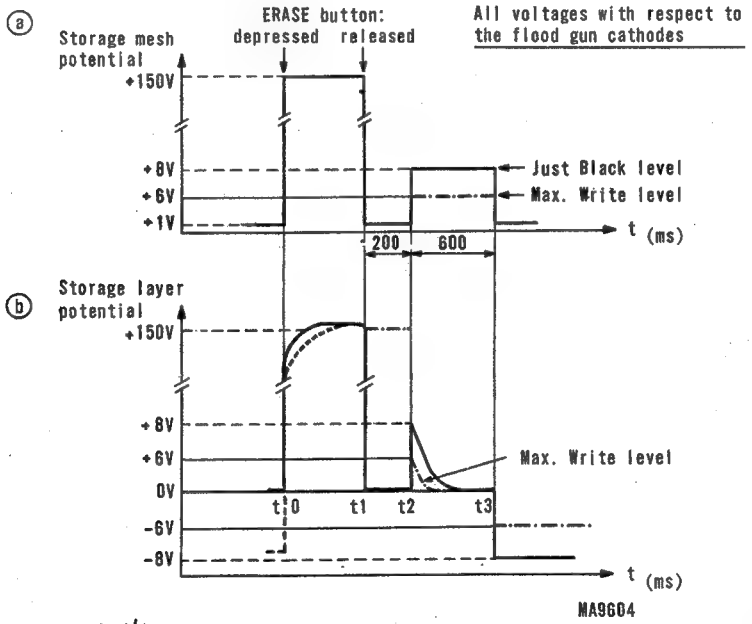


Fig. 3.6. Storage erase cycle

The 200 ms-off and 600 ms-on pulse generated by two circuits which are activated the moment the ERASE button is released.

- One circuit (TS 2101, 2102) which generates a 800 ms positive pulse at point 5 of IC 2102-B.
- The second circuit (TS 2112 and IC 2102-A) which generates a 200 ms zero pulse at point 12 of IC 2102-D.
- A third circuit (TS 2103 . . . 2105) which generates a 100 ms pulse in addition to the 800 ms pulse from TS 2102.
  The steep trailing edge of this 900 ms pulse resets both the main time-base and the delayed time-base.

The +8 V of the positive pulses which is given in this text and pulse diagrams, is only an orientational value. In practise pulses up to +15 V may occur (depending on calibrations and c.r.t. properties).

d. Variable persistence

This mode can be seen as a continuous write/erase operation.
A square-wave signal is now applied to the memory-mesh, derived from the output of IC 2101-B.
The duty-cycle of this signal, adjustable with the PERSIST knob (R15) controls the persistence time.
During the higher positive (+8 V) voltage on the storage mesh, the flood-gun electrons will lower the local surface layer voltage (the positive charges are filled-up by the electrons). If the duty-cycle of the higher positive voltage is increased the persistence time will decrease.

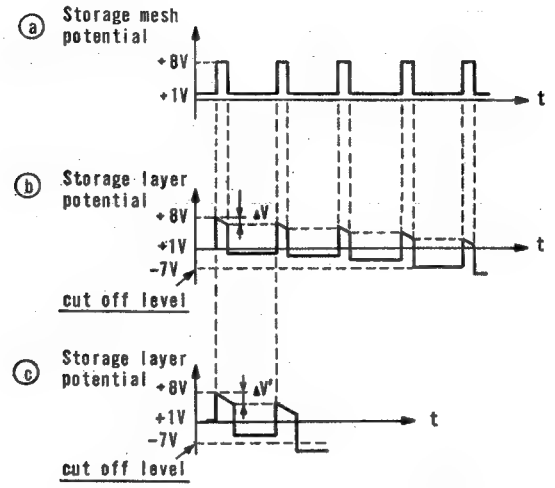


Fig. 3.7. Persistence mode

2. Beam current control*

In order to prevent damage of the cathode ray tube, due to too high dissipation of the electron beam on the memory mesh, an automatic beam current control circuit has been applied (TS 1322).
The blanking pulse, available at the emittor of TS 1328 is integrated by C1321/R1373.
The neg. side of C1321 is connected to the +6 V as fixed reference, via TS 1319 which is used as a switch.
TS 1319 is not conducting in positions:
– .5 s up to 10 ms incl. of the MTB sweep switch
– .2 s up to 10 ms incl. of the DTB sweep switch.
In this sweep-times no integration takes place, because this would include no equal brightness over the whole trace-length, however a certain negative feed-back control remains via the voltage divider R1373, 1374.

The integrated voltage across C1321 depends on:
– height of the Z-pulse (INTENS knob setting)
– duty-cycle of the Z-pulse (trigger, hold-off)

If the integrated voltage might increase, also the emitter voltage of TS 1322 increases which causes a higher current into the blanking amplifier input (TS 1323), resulting in decreasing beam circuit.
The average beam current (in the final anode circuit) is approx. 1 μA.

The +6 V reference for C1321 is taken from the base of TS 1323 in order to improve common mode suppression of the Z-amplifier.

In the EXT X DEFL mode the beam current control of not operative.

Modification beam current control circuit

(See Fig. 3.29.; TS 1319 detail for the old situation.

TS 1318 has been added, in order to obtain the same intensity ratio (m.t.b. sweep with intensified d.t.b.), in all time-base sweep speed positions.
In the old situation the intensity ratio at sweep speeds of 10 ms/div. and slower was remarkable lower (less brightness difference between intensified part and rest of the trace) then in the higher sweep speeds.
This is due to the fact that the integrated capacitor C1321 is switched-off in the slower sweep speed positions. Therefore an intensity ratio correction is then necessary.

TS 1318 draws current from the base-circuit of TS 1068 in the higher sweep speeds positions, which includes readjustment of R1115 (INTENS RATIO).

* *Formely known by the name: Automatic Brightness Control*

Required parts:

Transistor	TS 1318	BC 549C
Resistor	R1376	56,2 kohm MR25
Resistor	R1378	6,19 kohm MR25
Resistor	R1379	26,1 kohm MR25

From serial nr. D775 this modification is included in the instrument.

3. Dynamic focus control

The optimum focus setting of the c.r.t. is depending on the momentary c.r.t. electron beam current. As this current is also depending on the duty-cycle of the blanking pulse, the focus setting would be depending on the duty-cycle of the blanking pulse (trigger, hold-off, a.s.o.).
To compensate this, the d.c. focus voltage (g3 of the c.r.t.) is combined with a block voltage derived from the blanking pulse.

The blanking pulse available at the emittor of TS1328 is not only applied to the g1-circuit of the c.r.t., but also to the amplifier circuit TS1301 ... TS1303. This circuit inverts the signal and has a voltage gain of 1. The voltage at the emittor of TS1303 is applied to the focus circuit, via a d.c. path (TS1304) and an a.c. path (C1306), at the same way as in the intensity control circuit.

Both chopper circuits for the d.c. paths of the intensity- and the focus circuits have exactly the same frequency, obtained by the common, positive feed-back transistor TS1307.
In this way any frequency interference or zero-beat effect is suppressed.

4. Multiplier Fig. 3.21.

The signals on ch. A and ch. B can be multiplied.
The multiplied signal can be displayed (instead of ch. A) and taken-off from the output connector at the rear of the instrument.

The signals to be multiplied are taken from the intermediate amplifiers (points 4 and 5 of IC 302 of ch.A and 4 and 5 of IC 2302 of ch. B) and applied to the multiplier circuit.
The input circuits of the multiplier (IC 401, 402 for ch. A, and IC 2401, 2402 for ch. B) have a frequency compensation circuit for each channel. Also the 0 x A and 0 x B front panel adjustments take place in this circuits, for adjustment of the zero levels.
The ch. A and B signals are actually multiplied in IC 1901. Transistor TS 1901 controls the voltage levels in the multiplier circuit via the two diodes in IC 1901.
The output signal of IC 1901 is applied to IC 1902 by which the polarity of the multiplied signal can be inverted. If the ch. B signal is inverted (SK6), the ch. B signal to the multiplier is not inverted,
In this case also the multiplied signal must be inverted.

With preset potm. R1912 the zero levels for both normal- and inverted mode can be made equal. The scale factor (multiplier gain) is adjustable with R1931 which controls the resistance between points 4 and 5 of IC 1902, thus controlling the gain of the relative transistor-pair of IC 1902.
From the collectors of this transistor-pair the multiplied signal is fed to IC 1903, via TS 1903, 1904.

If SK1 (MULT) is depressed (contact 2-3 closed), TS 309 feeds current into IC 302, thus interrupting the normal ch. A signal path.
At the same time TS 1905 is cut-off (contact SK1 1-2 open), which allows the multiplied signal via IC 1903 to go back to the ch. A intermediate amplifier for further amplification.

From the emittors of the IC 1902 transistor-pair, also the multiplied signal is taken-off for the A x B output at the rear of the instrument. This signal is first amplified by a transistor-pair IC 2001 with frequency compensation circuit, and then via an output-stage TS 2002 . . . 2004 applied to the output connector.
The output signal is taken from the emitter-follower TS 2006, which is pre-loaded with TS 2004 for better common mode suppression.
TS 2001 regulates the A x B zero level with pot. meter R18 at the rear panel near the A x B output.
TS 2007 delivers an extra regulated supply voltage for the A x B output amplifier circuit.

The A x B output at the rear panel must be terminated with 50-ohms to obtain correct multiplication factor, and full bandwidth response.

Also, if the MULT. button is not depressed the multiplied signal is available at the A x B output connector.

3.4. CHECKING AND ADJUSTING

Introduction

This procedure describes how to check and adjust the following functions:
- Variable persistence/storage
- C.r.t. circuit
- Intermediate amplifier with multiplier

For the remaining subjects refer to the basic PM 3240 manual.

Before any adjustment or checking, the instrument must attain its normal operating temperature. Under average conditions this will be approximately 30 minutes after switching on.

All controls which are mentioned without item number are located on the front panel.

Use a viewing hood for better observation of the display.

Preliminary control settings

- Depress button A of the vertical display mode switch.
- Depress button MAIN TB of the horizontal display mode switch.
- Depress button AUTO of the trigger mode switch.
- MAIN TB sweep knob in position .1 ms/DIV.
- DEL'D TB sweep knob in position OFF.
- Both AMPL/DIV. knobs in position .1 V.
- All TIME/DIV. and AMPL/DIV. potmeters in CAL position.
- TB MAGN switch depressed (magnifier off).
- Set the POSITION controls to their mid-positions.
- Depress button AC of the A input coupling switch.
- Depress both buttons DC of the trigger-range selector switches.
- Depress button A of the MAIN TB source switch.
- Depress button MTB of the DEL'D TB trigger source switch.
- Knob HOLD OFF fully clockwise (shortest hold-off time).
- Depress both SAVE and READ buttons (MEMORY OFF).
- Operate the INTENS and FOCUS knobs to obtain a sharp trace of medium brightness.
- Set LEVEL controls for a stable display.
- When the instrument is in the WRITE mode, it is recommended to keep the PERSIST knob in the short-persistence position (fully counter clockwise).

  In this case the dynamic erase function is optimum.

1. Variable persistence/storage and writing speed

Introduction

- All adjustment controls are located on the persistence/storage unit.
- Remember to press the ERASE button in the WRITE mode after every (trial) adjustment.
- It is recommended first to check the adjustment of **R1329** (INT. MIN) on the Z-mod. unit, refer to **2***c*.
- The INTENS knob must be in the minimum position (fully counter clockwise) during the variable persistence/storage checking and adjusting procedure.
- Depress the WRITE button.
- No input signals.

a. Variable persistence/storage

Required instruments:
- Oscilloscope (5 MHz)
- Voltmeter

1. Memory mesh voltage (Adjustment only possible in older versions)
   - PERSIST control in position MAX. WRITE (fully clockwise)
   - The voltage on g9 must be +1 V with respect to earth.
     If necessary adjust **R2141** (VG 9)*
2. Collimator
   - PERSIST control in position minimum persistence (fully counter clockwise).
   - Check with **R2128** (V collim) that the green surface just overlaps the display surface of the c.r.t.

*R2142 was in series with R2140

Just no cushion-distortion; no rim-effects visible.
The collimator voltage will be between +55 V and +75 V.

3. Just black level.

Remind to press frequently the ERASE button.
— PERSIST control in position maximum persistence (not in MAX. WRITE).
— Adjust **R2168** (JUST BLACK) so that both "clouds" are visible and adjust **R2189** (BAL) so, that both "clouds" have same brightness.
After this, adjust **R2168** (JUST BLACK) so, that the display is just black. Use viewing hood.

4. Max. write

— PERSIST knob in position MAX. WRITE (press ERASE button).
Both "clouds" must be visible.
If necessary adjust **R2167** (INTENS. MAX. WRITE).

If necessary readjust **R2189** (BAL) for equal brightness of both "clouds". (The effect is clearly visible without operating the ERASE button).

If necessary adjust **R2131** (V COLLIM. MAX. WRITE), to obtain equal "cloud" distribution over the whole display surface.

Keep R2131 as fas as possible counter clockwise, otherwise the c.r.t.'s deflection sensitivity will decrease (press ERASE button).
If necessary adjust **R2124** (ΔV COLLIM) so, that the green surface just overlaps the display surface of the c.r.t. (equal background), especially in the corners and along the edge. No black centre.

If necessary repeat both points 3 and 4 for optimum results.

5. Save

— Depress button SAVE.
— The intensity of the display can be adjusted with **R2149** (SAVE).
— Apply the signal on G_2'-2" of the c.r.t. to an oscilloscope.
The duty cycle of the signal must be 10 % (for a save-time of 15 minutes).

6. Frequency

The frequency of the persist/storage control voltage depends on the position of **R2107** (FREQ.). Normally this pot. meter is in the mid-position.
Sometimes a ringing sound can be heard from the c.r.t. caused by resonance effects of the meshes. This can be suppressed by readjusting **R2107**.

b. Writing speed

Abstract from specification Writing speed.
Normal: 0,2 div/μs
Max. write: 2 div/μs

Required instrument:
– Sine-wave generator (2,5 kHz - 25 kHz, 1,6 $V_{p\text{-}p}$)

1. Definition

The writing speed is the maximum speed of the electron beam in X- or Y-direction on the screen in single-shot mode in which the written line is visible.
The lines of the pictures obtained must be clearly visible in Normal, as well as in Max. write mode.
Some divisions at the rim of the screen may be partly or entirely not written (the written surface of the screen must be as symmetrical as possible).
The number of not-written divisions may not be more than 16, viz. 20 % of the whole screen surface (not more than 4 in each screen-corner).

2. Checking

The writing speed is checked as follows:
– Depress button A of the vertical deflection switch.
– Depress button WRITE.
– Depress button MAIN TB of the horizontal deflection switch.
– Apply a 2,5 kHz sine-wave signal to the A input.
– MTB sweep 1 ms/DIV.
– Set PERSIST knob to minimum persistence.
– Centre the trace.
– With the input attenuator adjust the amplitude of the input signal in such a way that a picture height of 32 divisions (peak-to-peak) is obtained.
(To this end first set the input attenuator to position .2 V/DIV and adjust the picture-height to 8 divisions by varying the input signal; then set the input attenuator to position 50 mV/div.).
– Trigger and focus the picture obtained.
– Depress SINGLE button of the main time-base trigger switch.
– Set PERSIST knob to position maximum persistence (not MAX. WRITE).
– INTENS knob maximum.
– Push ERASE button (this resets also the main time-base).
– If necessary repeat and adjust the focussing*) to maximum.

For checking in Max. write mode the operation is the same but:

– Set PERSIST knob to position MAX. WRITE.
– Frequency of the input signal 25 kHz.
– Set main time-base switch to .1 ms/div.

3. Calculation

The vertical deflection is 32 divisions as mentioned under 2 above.
The path described by the electron beam is then 16 div. $\sin\omega t$ (ω being the circle frequency of the input signal).
The speed of the beam in the vertical direction is thus $16\omega\cos\omega t$ (the speed in horizontal direction is negligible).
For the visible part of the sine-wave, $\cos\omega t = 1$ may be assumed.
The writing speed is now (in Norm. writing mode):
$16.2\ \pi.2{,}5.10^3$ div./s = $2{,}5.10^5$ div./s = 0,25 div./μs.

*) *In fact the electron beam should be focussed on the storage mesh layer to obtain optimum writing speed.*

2. C.r.t. circuit

Introduction

All adjustment controls are located on the Z mod unit.
– Depress the WRITE button.
– PERSIST knob to minimum persistence (fully counter clockwise).
– No input signals.

Required instrument:
– Oscilloscope (5 MHz).

a. Trace rotation

– Depress the A button of the vertical mode switch.
– Depress the AUTO button of the main time-base trigger mode.
– Adjust the TRACE ROTATION pot. meter (at the left-hand side of the cabinet) so, that the trace runs in parallel to the centre horizontal graticule line.

b. Astigmatism and Focus

Use an **insulated screwdriver**. High voltage on FOCUS preset-pot. meter !

– Apply a 6 divisions 10 kHz sine-wave signal to the A input.
– MAIN TB sweep knob to 50 μs/DIV.
– Set the INTENS knob to medium intensity.
– Set the FOCUS knob for best sharpness of the displayed waveform.

If the operating range of the FOCUS knob is not correct:
– Set the FOCUS knob in its mid-position.
– Adjust **R1338** (FOCUS) and **R1341** (ASTIG) for a sharp trace.

c. Minimum Intensity Write-gun (just black)

– WRITE button depressed.
– Set the horizontal POSITION control such, that the start point of the trace is visible on the screen.
– Depress the SINGLE button of the MTB trigger mode selector.
– PERSIST knob in MAX. WRITE position.
– INTENS knob to minimum intensity (press ERASE button).
– Adjust **R1329** (INT. MIN.) so that the spot is just not visible.
Check over a 10-seconds period at least. (after 1 or 2 minutes the spot may get visible).

d. Maximum Intensity (beam-current control)

– Connect an oscilloscope (10 V/DIV) to the testpoint on the Z-ampl. unit (near TS 1328).
– Depress the AUTO button of the mtb trigger mode switch.
– MTB sweep .1 ms/DIV.
– INTENS knob fully clockwise.
– PERSIST knob fully counter-clockwise.
– Depress the LINE button of the mtb trigger source selector.
The main time-base is now triggered by the line frequency (mains).

The pulse on the testpoint must now be 45 $V_{p\text{-}p}$ (on +12 V level).
If necessary adjust **R1386** (INT. MAX.).

– Depress the A button of the mtb trigger source selector.
The main time-base is now free running.

The pulse on the test point must now be 20...25 $V_{p\text{-}p}$ on the 12 V level.

e. Intensity Ratio

– Depress the AUTO button of the mtb trigger mode switch.
– MTB sweep 1 ms/DIV.
– DTB sweep .2 ms/DIV.
– Check that the intensified part of the trace can well be distinguished from the rest of the trace, in the control range of the INTENS knob.
If necessary adjust **R1115** (INTENS. RATIO).
The intensified part can be shifted with the DELAY TIME knob.

f. Z-pulse

- MTB sweep .05 µs/DIV.
- DTB sweep in position OFF.
- Adjust horizontal POSITION knob so, that the start point of the trace is visible on the screen.
- The starting section of the trace must have same intensity as the rest of the trace (no intensity - under - or over-shoot).
  If necessary adjust trimmer **C1338** (Z-HF).
  Check at various positions of the INTENS knob.

g. Barrel and cushion distortion

- Depress the A button of the vertical display mode switch.
- Depress the EXT X DEFL button of the horizontal display mode switch.
- Depress the B button of the TRIG or X DEFL switch of the main time-base.
- Depress both AC buttons of the input coupling switches.
- Apply a 100 kHz 8-div. sine-wave signal to A input.
- Apply a 50 Hz 10-div. sine-wave signal to the B input.
- Adjust both input attenuators to obtain a deflection of 7,4 x 9,4 divisions.
- The displayed rectangle must fit between the lines in indicated in Fig. 3.8.
  If necessary adjust **R1344** (GEOM.).

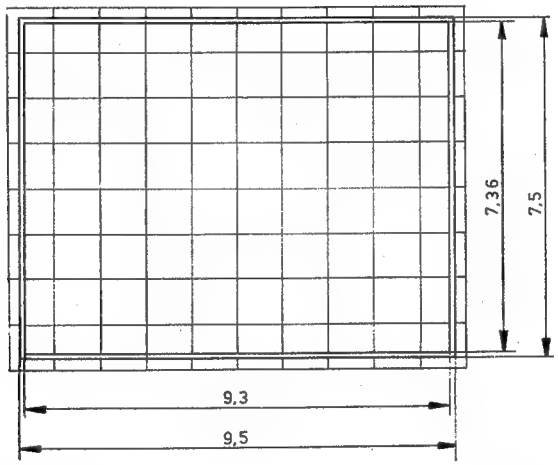


Fig. 3.8. Barrel and cushion distortion

MA 9558

- Depress the 0 button of the A input coupling switch.
- Check whether the trace runs over the horizontal centre graticule line.
  If necessary adjust **R18** (TRACE ROTATION) and/or **R1359** (ORT).
- Depress the AC button of the A input coupling switch.
- Depress the 0 button of the B input coupling switch.
- Check whether the trace runs over the vertical centre graticule line.
  If necessary readjust **R18**(TRACE ROTATION).

  Repeat if necessary.

h. R1390 (BEAM LIMIT). Only in older versions.

This pot. meter must be adjusted to 750 Ohm.

3. Input attenuator

Introduction

It is preferred to use the c.r.t. display in the MEMORY OFF mode (both SAVE and READ buttons depressed) for best observation of the display.

a. D.C. balance

No input signals.

1. 0-DC balance
   - — Step attenuator switch to 20 mV/DIV
   - — Depress alternately the 0 and DC buttons of the input coupling switch.

   The trace may not jump (max. 0,1 DIV).
   If necessary adjust **R129**
2. Step attenuator balance
   - — Rotate the step attenuator between the 5 mV and 20 mV/DIV positions.

   The trace may not jump (max. 0,1 DIV).
   If necessary adjust **R12** BAL.
3. Variable gain balance
   - — Step attenuator switch to 5 mV/DIV,
   - — Rotate the variable gain knob.

   The trace may not shift (max. 0,1 DIV).
   If necessary adjust **R141** (DC OFFSET COMP).

b. A.C. compensation

Required instrument:
- — Square-wave generator 120 mV_{p-p}.

1. 100 Hz square-wave compensation
   - — Input signal 100 Hz square-wave .
   - — Step attenuator switch to 20 mV/DIV.
   - — Adjust input voltage to obtain 6 div's vertical deflection.
   - — Main time-base sweep switch to 5 ms/DIV.

   The pulse distortion must be as low as possible (2 % max.).
   If necessary adjust **R132** (L.F. GAIN).
2. 25 kHz square-wave compensation.
   - — Input signal 25 kHz square-wave .
   - — Step attenuator switch to 20 mV/DIV.
   - — Adjust input voltage to obtain 6 div's vertical deflection.
   - — Main time-base sweep 10 μs/DIV.
   - — The pulse distortion must be as low as possible (2 % max.).
     If necessary adjust **C122.**
3. For adjustment of input capacity and capacitive input attenuation refer to basic PM 3240 manual.

4. Intermediate amplifier and multiplier

Introduction

It is preferred to use the c.r.t. display in the MEMORY OFF mode (both SAVE and READ buttons depressed) for best observation of the display.

Note that during the checking of the multiplier circuits the OXA and OXB settings must be set for optimum zero-product compensation. Exact adjustment of the multiplier balance OXA and OXB settings is possible after adjustment of **R338** (see point a).

a. D.C. balance

Required instruments:
- — 1 V regulated d.c. voltage source.
- — Sine-wave generator 1 kHz.

1. Multiplier zero balance

   – Depress both MULT and B button of the vertical mode switch.
   – Depress the 0 button of the A input coupling switch.
   – Depress B input coupling AC switch.
   – Apply a 1 kHz sine-wave signal to input B.
   Set input attenuator B and the input voltage such that 6 DIV_{p-p} B deflection is obtained.
   – Check that the zero product compensation lies symmetrically around the centre of the OXB control.
   If necessary adjust **R338** (+/–).

2. Multiplier balance OXA, OXB

   The OXA and OXB controls are operated by pushing the POSITION knobs.

   – Apply a 1 kHz sine-wave signal to both inputs A and B.
   – Set both attenuators for a deflection of 6 divisions.
   – Depress pushbutton MULT of the display-mode controls.
   – Depress pushbutton 0 of the channel A signal coupling controls.
   – Depress pushbutton AC of the channel B signal coupling controls.
   – Minimize the deflection by means of the OXB potentiometer without changing the attenuator setting.
   – Depress pushbutton AC of the channel A signal coupling controls.
   – Depress pushbutton 0 of the channel B signal coupling controls.
   – Minimize the deflection by means of the OXA potentiometer without changing the attenuator setting.

3. NORM/INVERT channel B.

   – Depress the B button of the vertical display mode switch.
   – Depress the 0 button of the B input coupling switch.
   – Check that the trace on the display does not jump when the NORM/INVERT switch is operated.
   If necessary adjust pot. meter **R2338** (+/–).

4. NORM/INVERT multiplier product.

   If channel B is inverted also the product is inverted; here is how to adjust this product-norm/invert balance.

   – Depress the 0 buttons of both input coupling switches.
   – Check that the product-trace does not jump when the NORM/INVERT switch is operated.
   If necessary adjust **R1912** (+/–).

5. Multiplier balance

   If both Y channels input voltages are zero, also the multiplier product must be zero.

   – Depress the 0 buttons of both input coupling switches.
   – Depress alternating the A and the MULT button of the vertical display mode switch.
   – Check the trace (A/MULT) does not jump.
   If necessary adjust **R1946** (BAL MULT).
   – Check the signal at the A x B output of the rear.
   If necessary adjust the A x B BAL control.

6. Multiplier gain (scale factor)

   – Depress the ALT button of the vertical display mode switch.
   – Depress the DC button of the A input coupling switch.
   – Apply the 1 V d.c. voltage to the A input.
   – Set the A input attenuator to obtain a deflection of 1 division.
   – Depress the AC button of the B input coupling switch.
   – Apply a 1 kHz sine-wave signal to the B input
   – Set the B input attenuator to obtain a deflection of 6 divisions.
   – Depress the MULT button of the vertical mode switch.
   – The multiplied signal must also show 6 divisions.
   If necessary adjust **R1931** (GAIN).

7. For adjustment of TRIG potmeters R362 and R2362 refer to basic PM 3240 manual.

b. H.F. compensation

General.

The intermediate amplifier of the –/03 version is different from the 01/ and /02 versions. At the /01 and /02 intermediate amplifier the h.f. compensation circuits are located on small p.c. boards; see Fig. 3.22 In the –/03 version the h.f. compensation circuits have been incorporated on the p.c. board itself; see Fig. 3.23.
First check whether the cause of an eventual signal distortion in the multiplier function is located in the A multipl. path, the B multipl. path, or in the multiplier-circuit itself.

– The main time-base sweep knob must be set for best possible observation of the pulse response, during the various frequency settings of the input signal.
– Depress the AC buttons (except at 1 kHz signals) of both input coupling switches, in order to remain within the dynamic range specifications.
When the d.c. voltages are applied (multiplier response) depress the relevant D.C. button.

Required instruments:
– 1 V regulated d.c. voltage source
– Pulse generator, rise time ⩽ 1 ns, with matched cable and cable-end termination.

Set the pulse generator to 120 mV_{p-p} output voltage.

1. Straight forward ch. A.

– Depress button A of the vertical display mode switch.
– Apply the hf test signal to the A input.
– Set the A attenuator for 6 divisions deflection.
– Check the displayed signal.

If necessary, adjust or select following components depending on the frequency of the input signal.

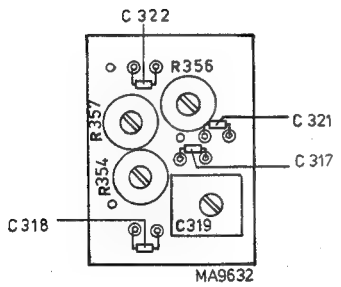


Fig. 3.9. H.F. compensation ch. A

Sequence	*Freq.*	*Item*	*Approx. value*
1	1 kHz	R354	–
		C318	4,7 nF
2	10 kHz	R357	–
		C322	820 pF
3	100 kHz	R356	–
		C319	–
		C321	27 pF
4	1 MHz	C317	0-10 pF

C302 can be adjusted at 100 kHz . . . 1 MHz.

2. Straight forward ch. B.

– Depress button B of the vertical mode switch.
– Apply the h.f. test signal to the B input.
– Set the B attenuator for 6 divisions delfection.
– Depress the NORM button of the B attenuator.
– Check the displayed signal.

If necessary, adjust or select following components depending on the frequency of the input signal.

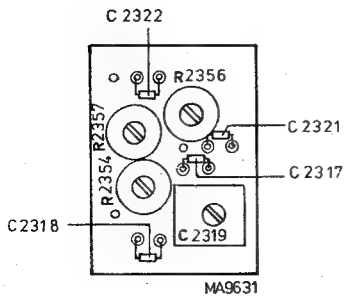


Fig. 3.10. H.F. compensation ch. B

Sequence	*Freq.*	*Item*	*Approx. value*
1	1 kHz	R2354	–
		C2318	4,7 nF
2	10 kHz	R2357	–
		C2322	820 pF
3	100 kHz	R2356	–
		C2319	–
		C2321	27 pF
4	1 MHz	C2317	0-10 pF

C2302 can be adjusted at 100 kHz - 1 MHz.

3. Straight-forward common A and B

   Knob settings and test signals as under 1 or 2.

   Check the displayed signal.

   If necessary, adjust or select following components, at 1 MHz.
   – C506 - (22 pF)
   – R514 - 4,99 ohm

4. A multiplier path

   – Depress button ALT of the vertical display mode switch.
   – Apply the h.f. test signal to the A input.
   – Set the A attenuator for 6 divisions deflection.
   – Apply the 1 V d.c. voltage to the B input.
   – Set the B attenuator for 1 div. deflection.
   – Depress the MULT button.
   – Check the h.f. response of the displayed multiplied signal (the signal must be 6 div.'s p-p).

   If necessary adjust or select following components depending on the frequency of the test signal.

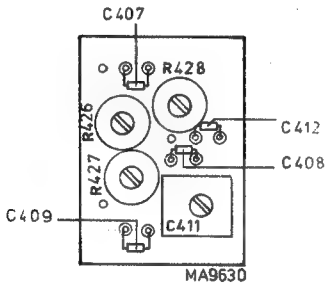


Fig. 3.11. H.F. compensation A MULT

Sequence	*Freq.*	*Item*	*Approx. value*
1	1 kHz	R427	–
		C409	10 nF
2	10 kHz	R426	–
		C407	4,7 nF
3	100 kHz	R428	–
		C411	–
		C412	15 . . .22 pF
4	1 MHz	C408	0 – 39 pF

Pulse-top flatness at 30 kHz can be adjusted with
– R447 –
– C414 1 nF

5. B multiplier path

   – Depress button ALT of the vertical display mode switch.
   – Apply the 1 V d.c. voltage to the A input.
   – Set the A attenuator for 1 div. deflection.
   – Apply the h.f. test signal to the B input.
   – Set the B attenuator for 6 div. deflection.
   – Depress the MULT button.
   – Check the h.f. response of the displayed multiplied signal (the signal must be 6 div.'s p-p).

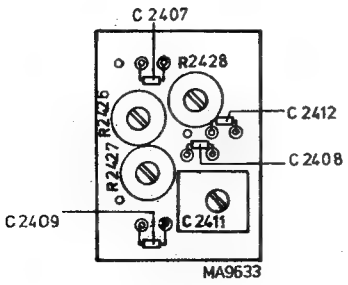


Fig. 3.12. H.F. compensation B MULT

Sequence	*Freq.*	*Item*	*Approx. value*
1	1 kHz	R2427	–
		C2409	10 nF
2	10 kHz	R2426	–
		C2407	4,7 nF
3	100 kHz	R2428	–
		C2411	–
		C2412	15...22 pF
4	1 MHz	C2408	33 pF

Pulse-top flatness at 30 kHz can be adjusted with
– R2447
– C2414 1 nF

6. Multiplier common

   Knob settings and test signals as under 4 or 5.

   — Check the displayed multiplied signal at a frequency of 1 MHz.

   If necessary adjust or select:
   — R1927
   — C1908 (22 pF)

7. Multiplier output h.f. response and gain.

   Knob settings and test signals as under 4 or 5.

   — Terminate the multiplier output at the rear panel with a 50 ohm termination.
   — Check the multiplier output voltage with a wide-band oscilloscope.
   Set this oscilloscope to 50 mV/div. in order to obtain the same 6 div.'s p-p display as on the oscilloscope under test.
   — If necessary adjust R2008, in order to obtain the exact output voltage.
   — If necessary adjust or select following components depending on the frequency of the test signal.

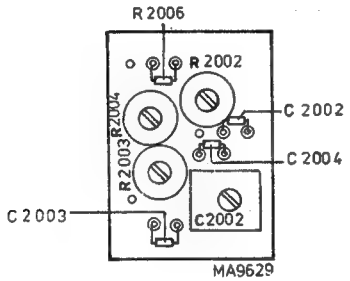


Fig. 3.13. H.F. compensation MULT. OUTPUT

Sequence	*Freq.*	*Item*	*Approx. value*
1	1 kHz	R2003	—
		C2003	10 nF
2	10 kHz	R2004	—
		C2006	(39 pF)
3*	100 kHz	R2002	—
		C2002	—
		C2001	22 – 39 pF
4*	1 MHz	C2004	56 –82 pF

*in combination with: — C2011

c. In some earlier PM 3243 models, the h.f. response compensation p.c. board were different from those drawn in this checking and adjusting procedure.

Fig. 3.14 shows the old model p.c. boards.
The sequence-numbers are identical.

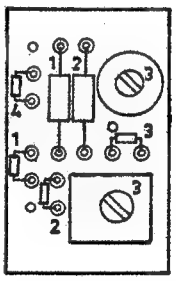


Fig. 3.14. H.F. compensation units, older models

d. *Bandwidth check*

Required instruments:

— Constant-amplitude sine-wave generator 50 kHz - 50 MHz
— 1 V regulated d.c. voltage source.

1. Straight-forward

   — Apply the sine-wave signal to the A-input.
   — A-input attenuator in position 0,1 V/div.
   — Adjust the signal amplitude in order to obtain 8 divisions deflection.
   Input frequency 50 kHz
   — Increase the frequency until the deflection is decreased to 5,6 divisions (–3 dB).
   — Repeat for the B channel.

2. Multiplier

   — Depress button ALT of the vertical display mode switch.
   — Apply the sine-wave signals to the A input, and set the A deflection as stated under 1.

– Apply the 1 V d.c. voltage to the B input.
  Set B deflection to 1 div.
– Depress button MULT.
– Increase the frequency until the deflection is decreased from 8 divisions to 5,6 divisions.
– Repeat with signals at inputs A and B interchanged.
– The multiplier output bandwidth can be checked similarly with a wide-band oscilloscope connected to the socket at the rear panel.
  The output must be terminated with 50 ohm.

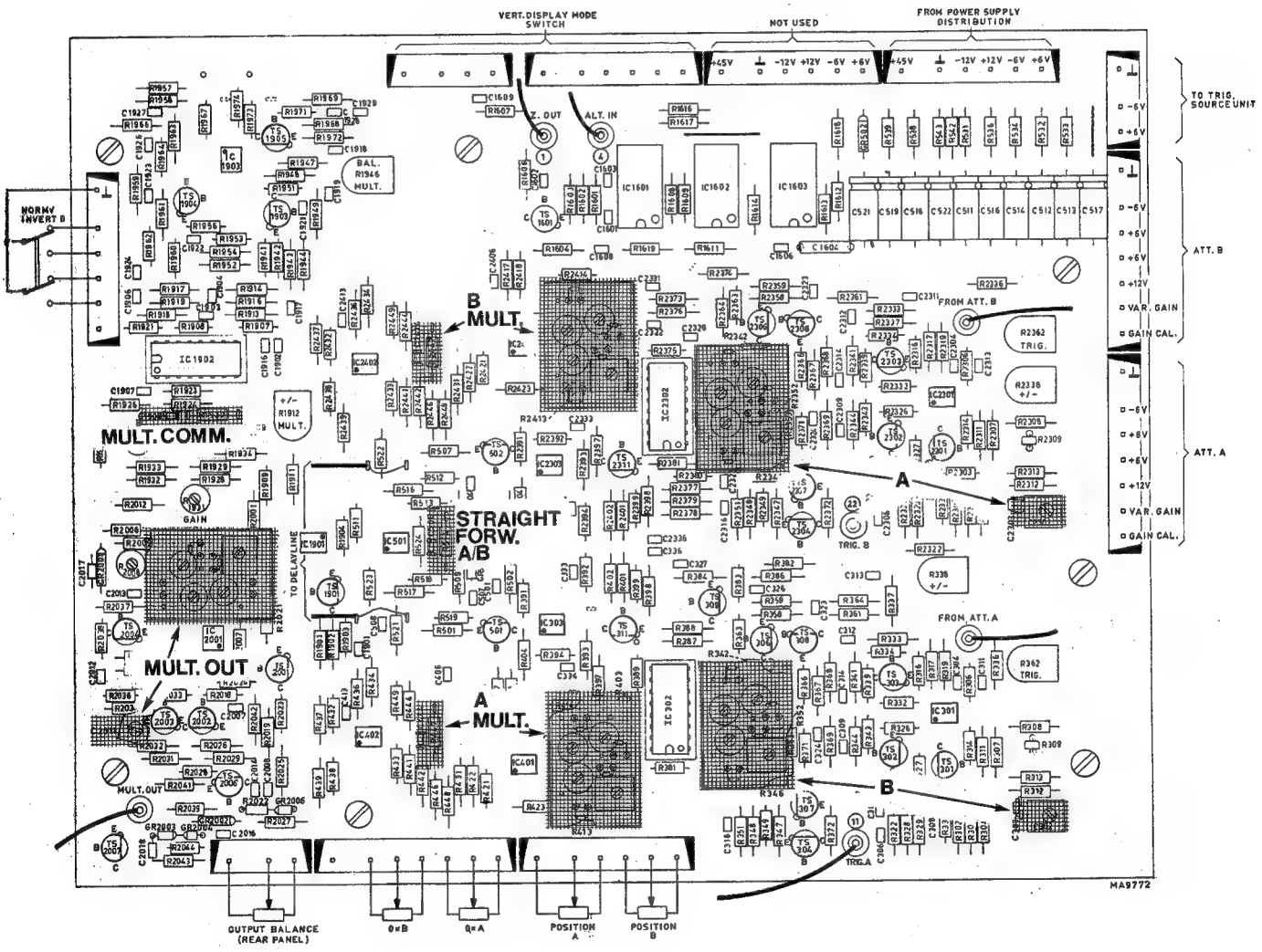


Fig. 3.14a. Location h.f. compensation circuits

3.5. PARTS LIST

MECHANICAL PARTS

For standard mechanical parts refer to the basic PM 3240 manual.

Complete units

Attenuator	5322 105 34044
Intermediate amplifier	5322 216 54159
Final Y-amplifier	5322 216 54161
Trigger source unit	5322 216 54163
Time-base with X-amplifier	5322 216 54157
Z-Amplifier	5322 216 54158
2 kV generator	5322 216 54156
High tension multipl. block	5322 218 64061
Var. pers./storage circuit	5322 216 54164
Auxiliary unit	5322 216 54162
Power supply unit	5322 216 54155

Various parts

Front side parts

–	5322 414 24911	Red push-button
–	5322 278 74007	Switch reset bar of push button switch assy's
–	5322 414 34136	Knob POSITION, 0 x BAL
–	5322 414 74019	Cover for this knob
–	5322 455 84061	Test strip in carrying handle
–	5322 455 84059	Text plate, front
–	5322 480 34046	Contrast filter, grey
–	5322 480 34074	Contrast filter, blue

Internal parts

–	5322 462 54133	Magnetic shield of c.r.t., top half
–	5322 462 54134	Magnetic shield of c.r.t., bottom half
–	5322 535 74525	Isolating shaft, 400 mm
–	5322 535 74526	Isolating shaft, 93 mm.
B1	5322 131 24041	Storage tube 89L14GH/55
T1802	5322 142 64064	Output transformer power supply unit

ELECTRICAL PARTS

TRANSISTORS

Type	*Stamp if SOT-23*	*Number in one instrument*	*Ordering code*	*Encapsulation*
BC547	–	6	5322 130 44257	TO-92 (2)
BC547C	–	2	5322 130 44503	TO-92 (2)
BC549	–	49	4822 130 40964	TO-92 (2)
BC549C	–	14	5322 130 44246	TO-92 (2)
BC557	–	6	5322 130 44256	TO-92 (2)
BC558	–	9	4822 130 40941	TO-92 (2)
BC559	–	21	4822 130 40963	TO-92 (2)
BCY71	–	2	5322 130 40373	TO-18
BD139	–	1	5322 130 40823	TO-126
BDY93/01	–	1	5322 130 44457	TO-3
BF199	–	6	5322 130 44154	TO-92(1)
BF324	–	17	5322 130 44396	TO-92(2)
BF336	–	2	4822 130 40908	TO-39
BF338	–	4	5322 130 44108	TO-39
BFR92R	P4	2	5322 130 44606	SOT-23
BFS17	E1	7	5322 130 40781	SOT-23
BFS17R	E4	6	5322 130 44338	SOT-23
BFT25R	V4	2	5322 130 44459	SOT-23
BFW44	–	4	5322 130 40672	TO-39
BFY90	–	9	5322 130 40493	TO-72(1)
BRY39	–	1	5322 130 40482	TO-72(3)
BSS38	–	4	4822 130 40968	TO-92(2)
BSW68	–	1	5322 130 40714	TO-39
BSX20	–	6	5322 130 40417	TO-18
BSX60	–	1	5322 130 44019	TO-39
BTX18/500	–	1	5322 130 24009	TO-39
CNY43	–	1	5322 130 44395	SOT-91B
FW5324	–	2	5322 130 40142	TO-72
FW5497	–	2	5322 130 40673	TO-72
ON471	M3	2	5322 130 44065	SOT-23
2N2894	–	2	5322 130 40018	TO-18
2N2894A	–	4	5322 130 44127	TO-18
537-BSY	B3	1	5322 130 44359	SOT-23
BU126	–	*	5322 130 44406	TO-3

*Selected pair in power supply unit.

DIODES

Type	*Number in one instrument*	*Ordering code*
Small signal and rectifier diodes		
AAZ15	2	5322 130 30229
AAZ17	2	5322 130 30283
AAZ18	1	5322 130 30084
BA182	3	5322 130 30644
BAV21	10	4822 130 30842
BAV45	2	5322 130 34037
BAW62	64	5322 130 30613
BAX12	2	5322 130 30424
BR100	1	4822 130 20039
BY206	23	4822 130 30839
BY409	1	5322 130 34594
BYX55/600	8	4822 130 30817
Voltage reference and stabistor diodes		
BZX61/C36	1	5322 130 30507
BZX61/C47	1	5322 130 30565
BZX61/C68	1	5322 130 30431
BZX61/C75	1	5322 130 34034
BZX75/C2V1	1	5322 130 34049
BZX75/C2V8	3	5322 130 34048
BZX79/B6V2	3	5322 130 34167
BZX79/B7V5	3	4822 130 30861
BZX79/B8V2	3	5322 130 34382
BZX79/B27	1	5322 130 34379
BZX79/B62	2	5322 130 34384
BZX79/C4V7	2	5322 130 30773
BZX79/C5V1	1	5322 130 30767
BZX79/C5V6	4	5322 130 34173
BZX79/C10	1	5322 130 34297
BZX79/C12	2	5322 130 34197
BZX79/C16	1	5322 130 34068
BZX79/C22	1	5322 130 30783
BZY88/C3V3	1	5322 130 30392
Light emitting diode		
CQY24A-1	2	5322 130 34595

INTEGRATED CIRCUITS

Type	*Number in one instrument*	*Ordering code*	*Encapsulation*
Digital circuits			
N7400	1	5322 209 84528	DIL14p
N7426	1	5322 209 84512	DIL14p
N7472	1	5322 209 84166	DIL14p
FZH181	1	5322 209 84379	DIL14p
Op. Amp. circuits			
LM208T	2	5322 209 85475	T
LM723CH	4	5322 209 84899	L
TCA220	1	5322 209 84386	DIL16p
709HC	1	5322 209 84452	T
Various			
OQ002	13	5322 209 84355	–
OQ006	1	5322 209 84356	–
OQ012	3	5322 209 85484	DIL14p
Resistor pad-IC102	2	5322 111 94032	–

CAPACITORS

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
C 101	5322 125 64009	3PF		500	TRIMMER
C 102	5322 125 64015	4,5PF		500	TRIMMER
C 103	5322 123 34001	30PF	10	300	MICA
C 104	4822 121 40278	22NF	10	400	POLYESTER FOIL
C 105	4822 122 31047	5,6PF	0,25PF	100	CERAMIC PLATE
C 106	4822 122 31205	47PF	2	500	CERAMIC PLATE
C 107	5322 125 64012	1,5PF		400	TRIMMER
C 108	5322 125 64015	4,5PF		500	TRIMMER
C 109	5322 125 64009	3PF		500	TRIMMER
C 111	5322 125 64015	4,5PF		500	TRIMMER
C 112	5322 123 10168	300PF	10	300	MICA
C 113	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 114	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 116	4822 122 31173	220PF	2	500	CERAMIC PLATE
C 118	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 121	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 123	4822 122 30027	1NF	-20+80	40	CERAMIC PLATE
C 124	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 125	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 128	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 129	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 130	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 301	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 302	5322 125 50051	18PF		300	TRIMMER
C 303	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 304	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 306	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 307	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 308	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 309	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 311	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 312	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 313	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 314	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 316	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 317	4822 122 31058	15PF	2	100	CERAMIC PLATE
C 318	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 319	5322 125 50051	18PF		300	TRIMMER
C 321	4822 122 31061	18PF	2	100	CERAMIC PLATE
C 322	4822 122 30091	390PF	10	100	CERAMIC PLATE
C 323	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 324	4822 122 30045	27PF	2	100	CERAMIC PLATE
C 326	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 327	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 333	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 334	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 336	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 406	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 407	4822 122 30048	1,8NF	10	100	CERAMIC PLATE
C 408	4822 122 30045	27PF	2	100	CERAMIC PLATE
C 409	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 411	5322 125 50051	18PF		300	TRIMMER
C 412	4822 122 31069	39PF	2	100	CERAMIC PLATE
C 413	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 414	4822 122 30055	330PF	10	100	CERAMIC PLATE
C 501	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 503	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 504	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 506	4822 122 31067	33PF	2	100	CERAMIC PLATE
C 507	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 508	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 511	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 512	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 513	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 514	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 516	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
C 517	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 518	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 519	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 521	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 522	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 601	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 602	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 603	4822 125 50045	22PF		100	TRIMMER
C 604	4822 122 31074	56PF	2	100	CERAMIC PLATE
C 605	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 606	4822 125 50045	22PF		100	TRIMMER
C 607	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 608	4822 122 30027	1NF	10	100	CERAMIC PLATE
C 609	4822 122 31116	2,2NF	10	100	CERAMIC PLATE
C 614	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 616	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 618	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 619	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 621	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 622	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 623	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 624	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 626	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 627	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 628	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 629	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 631	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 632	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 633	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 634	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 651	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 652	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 653	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 701	4822 122 31198	18PF	2	500	CERAMIC PLATE
C 702	4822 121 40146	100NF	10	400	POLYESTER FOIL
C 703	4822 122 31202	33PF	2	500	CERAMIC PLATE
C 704	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 706	4822 122 31038	2,7PF	0,25PF	100	CERAMIC PLATE
C 707	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 708	4822 122 31177	470PF	10	100	CERAMIC PLATE
C 709	4822 122 31177	470PF	10	100	CERAMIC PLATE
C 751	4822 122 31198	18PF	2	500	CERAMIC PLATE
C 752	4822 121 40146	100NF	10	400	POLYESTER FOIL
C 753	4822 122 31202	33PF	2	500	CERAMIC PLATE
C 756	4822 122 31038	2,7PF	0,25PF	100	CERAMIC PLATE
C 757	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 758	4822 122 31177	470PF	10	100	CERAMIC PLATE
C 759	4822 122 31177	470PF	10	100	CERAMIC PLATE
C 761	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 762	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 801	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 802	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 803	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 804	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 805	4822 122 31036	2,2PF	0,25PF	100	CERAMIC PLATE
C 806	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 807	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 808	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 809	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 850	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 851	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 852	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 853	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 854	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 855	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 856	4822 122 31061	18PF	2	100	CERAMIC PLATE
C 857	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 858	4822 124 20483	6,8UF	-10+50	40	ELECTROLYTIC
C 859	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
C 860	4822 122 31047	5,6PF	0,25PF	100	CERAMIC PLATE
C 861	4822 122 31061	18PF	2	100	CERAMIC PLATE
C 862	4822 122 30114	2,2NF	10	100	CERAMIC PLATE
C 863	4822 124 20459	22UF	-10+50	10	ELECTROLYTIC
C 864	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 866	4822 121 50549	442PF	1	250	POLYSTYRENE FOIL
C 867	5322 121 40224	4,7UF	10	100	POLYESTER FOIL
C 868	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 869	5322 121 54108	47NF	1	63	POLYSTYRENE FOIL
C 871	5322 121 14072	330NF		35	BOX
C 872	4822 122 30034	470PF	10	100	CERAMIC PLATE
C 873	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 874	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 876	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 878	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 879	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 881	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 882	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1001	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1002	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1003	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1004	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1005	4822 122 31036	2,2PF	0,25PF	100	CERAMIC PLATE
C 1006	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1007	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1008	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1009	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1051	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1052	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1053	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1054	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 1056	4822 122 31061	18PF	2	100	CERAMIC PLATE
C 1057	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1058	4822 122 31061	18PF	2	100	CERAMIC PLATE
C 1059	4822 121 50549	442PF	1	250	POLYSTYRENE FOIL
C 1060	4822 122 31047	5,6PF	0,25PF	100	CERAMIC PLATE
C 1061	5322 121 54108	47NF	1	63	POLYSTYRENE FOIL
C 1062	4822 122 30034	470PF	10	100	CERAMIC PLATE
C 1063	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1064	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1065	5322 121 40224	4,7UF	10	100	POLYESTER FOIL
C 1066	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1067	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1068	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1069	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1201	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1202	4822 122 31034	1,8PF	0,25PF	100	CERAMIC PLATE
C 1203	4822 125 50077	5,5PF		100	TRIMMER
C 1204	4822 122 31116	2,2NF	10	500	CERAMIC PLATE
C 1205	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1206	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1207	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1208	4822 125 50077	5,5PF	10	250	TRIMMER
C 1209	4822 122 31034	1,8PF	0,25PF	100	CERAMIC PLATE
C 1211	4822 122 31116	2,2NF	10	500	CERAMIC PLATE
C 1212	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1213	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1214	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1216	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1301	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 1302	4822 122 30098	3,9NF	10	100	CERAMIC PLATE
C 1303	4822 122 30098	3,9NF	10	100	CERAMIC PLATE
C 1304	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 1305	4822 121 41134	10NF	10	250	POLYESTER FOIL
C 1306	4822 121 40253	1NF	10	1600	POLYESTER FOIL
C 1307	4822 121 40253	1NF	10	1600	POLYESTER FOIL
C 1308	4822 122 31081	100PF	2	100	CERAMIC PLATE
C 1309	5322 122 54006	3,3NF	-20+50	3K	CERAMIC DISK

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
C 1310	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1311	5322 122 54004	470PF	20	4K	CERAMIC DISK
C 1312	4822 121 40411	33NF	10	250	POLYESTER FOIL
C 1313	4822 122 31081	100PF	2	100	CERAMIC PLATE
C 1314	5322 122 54004	470PF	20	4K	CERAMIC DISK
C 1315	4822 121 41134	10NF	10	250	POLYESTER FOIL
C 1316	4822 121 40357	3,3NF	10	1600	POLYESTER FOIL
C 1317	4822 121 41134	10NF	10	250	POLYESTER FOIL
C 1319	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1321	4822 124 20452	33UF	-10+50	6,3	ELECTROLYTIC
C 1322	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1323	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1325	4822 122 30043	10NF	0	40	CERAMIC PLATE
C 1326	4822 124 20466	4,7UF	-10+50	16	ELECTROLYTIC
C 1327	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1328	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1329	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1331	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1332	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1333	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1334	4822 122 30114	2,2NF	10	100	CERAMIC PLATE
C 1338	5322 125 50048	3,5PF		300	TRIMMER
C 1339	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 1341	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1342	4822 122 31058	15PF	2	100	CERAMIC PLATE
C 1501	4822 124 20497	15UF	-10+50	63	ELECTROLYTIC
C 1502	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1503	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1504	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1506	5322 122 54006	3,3NF	-20+50	3K	CERAMIC DISK
C 1507	4822 121 40363	10NF	10	1600	POLYESTER FOIL
C 1517	5322 122 54004	470PF	20	4K	CERAMIC DISK
C 1518	5322 122 54004	470PF	20	4K	CERAMIC DISK
C 1519	5322 122 54004	470PF	20	4K	CERAMIC DISK
C 1521	5322 122 54004	470PF	20	4K	CERAMIC DISK
C 1522	5322 122 24001	600PF	20	9K	CERAMIC TUBULAR
C 1601	4822 122 30027	1NF	10	100	CERAMIC PLATE
C 1602	4822 122 30094	220PF	10	100	CERAMIC PLATE
C 1603	4822 122 30053	680PF	10	100	CERAMIC PLATE
C 1604	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1606	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1608	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1609	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1621	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1622	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1623	4822 122 31081	100PF	2	100	CERAMIC PLATE
C 1624	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1626	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1627	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 1642	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1643	4822 122 31081	100PF	2	100	CERAMIC PLATE
C 1644	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1646	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1647	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 1801	5322 121 44142	220NF	10	250	POLYESTER FOIL
C 1802	5322 122 44009	2,2NF	20	250	CERAMIC DISK
C 1803	5322 122 44009	2,2NF	20	250	CERAMIC DISK
C 1804	5322 121 44142	220NF	10	250	POLYESTER FOIL
C 1805	4822 121 40427	220NF	10	100	POLYESTER FOIL
C 1806	4822 124 40066	2X50UF		400	ELECTROLYTIC
C 1807	4822 124 40066	2X 50UF		400	ELECTROLYTIC
C 1808	4822 124 20462	100UF	-10+50	10	ELECTROLYTIC
C 1809	5322 124 24153	220UF		100	ELECTROLYTIC
C 1810	4822 124 20581	220UF	-10+50	4	ELECTROLYTIC
C 1811	4822 121 40239	47NF	10	100	POLYESTER FOIL
C 1812	4822 124 20581	220UF	-10+50	4	ELECTROLYTIC
C 1813	4822 122 31173	220PF	10	100	CERAMIC PLATE
C 1814	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
C 1815	4822 121 40208	1UF	10	250	POLYESTER FOIL
C 1816	4822 121 40104	150NF	10	250	POLYESTER FOIL
C 1817	4822 121 40452	1,5UF	10	100	POLYESTER FOIL
C 1818	4822 124 20483	6,8UF	-10+50	40	ELECTROLYTIC
C 1819	4822 121 41169	220NF	10	250	POLYESTER FOIL
C 1820	4822 122 31175	1NF	10	100	CERAMIC PLATE
C 1821	4822 121 40407	22NF	10	250	POLYESTER FOIL
C 1822	4822 121 41169	1,5UF	10	100	POLYESTER FOIL
C 1823	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1824	4822 124 20465	330UF	-10+50	10	ELECTROLYTIC
C 1825	5322 122 54006	3,3NF	-20+50	3K	CERAMIC DISK
C 1826	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1827	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1828	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1829	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1830	4822 121 40104	150NF	10	250	POLYESTER FOIL
C 1831	4822 124 20497	15UF	-10+50	63	ELECTROLYTIC
C 1832	4822 124 20497	15UF	-10+50	63	ELECTROLYTIC
C 1833	4822 124 20488	100UF	-10+50	40	ELECTROLYTIC
C 1834	4822 124 20485	33UF	-10+50	40	ELECTROLYTIC
C 1835	4822 121 40239	47NF	10	250	POLYESTER FOIL
C 1836	4822 124 20488	100UF	-10+50	40	ELECTROLYTIC
C 1837	4822 124 20485	33UF	-10+50	40	ELECTROLYTIC
C 1838	4822 124 20469	68UF	-10+50	16	ELECTROLYTIC
C 1839	4822 124 20469	68UF	-10+50	16	ELECTROLYTIC
C 1840	4822 121 41161	100NF	10	250	POLYESTER FOIL
C 1841	4822 124 20469	68UF	-10+50	16	ELECTROLYTIC
C 1842	4822 124 20469	68UF	-10+50	16	ELECTROLYTIC
C 1843	4822 124 20454	150UF	-10+50	6,3	ELECTROLYTIC
C 1844	4822 124 20454	150UF	-10+50	6,3	ELECTROLYTIC
C 1845	4822 121 40411	33NF	10	400	POLYESTER FOIL
C 1846	4822 124 20454	150UF	-10+50	6,3	ELECTROLYTIC
C 1847	4822 124 20454	150UF	-10+50	6,3	ELECTROLYTIC
C 1849	4822 122 31177	470PF	10	500	CERAMIC PLATE
C 1851	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 1881	4822 121 41134	10NF	10	250	POLYESTER FOIL
C 1901	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1902	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1903	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1904	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1906	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1907	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1908	4822 122 31063	22PF	2	100	CERAMIC PLATE
C 1909	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1916	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 1917	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1918	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1919	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1921	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 1922	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1923	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1924	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 1926	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 1927	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1928	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 1929	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2002	5322 125 50051	18PF			TRIMMER
C 2007	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 2008	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2012	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 2013	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2014	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2016	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2101	5322 124 20377	68UF	-10+50	16	ELECTROLYTIC
C 2102	4822 121 40239	47NF	10	250	POLYESTER FOIL
C 2103	4822 121 41134	10NF	10	250	POLYESTER FOIL
C 2104	5322 121 40197	1UF	10	100	POLYESTER FOIL
C 2105	4822 124 20466	4,7UF	-10+50	16	ELECTROLYTIC
C 2106	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE

ITEM	ORDERING NUMBER	FARAD	TOL (%)	VOLTS	REMARKS
C 2107	4822 121 40257	330NF	10	100	POLYESTER FOIL
C 2109	4822 121 41161	470PF	10	100	POLYESTER FOIL
C 2111	4822 122 31165	330PF	10	100	CERAMIC PLATE
C 2112	4822 121 40239	47NF	10	250	POLYESTER FOIL
C 2113	4822 121 40239	47NF	10	250	POLYESTER FOIL
C 2114	4822 121 40239	47NF	10	250	POLYESTER FOIL
C 2116	4822 121 40239	47NF	10	250	POLYESTER FOIL
C 2117	4822 121 40239	47NF	10	250	POLYESTER FOIL
C 2119	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2120	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2121	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2122	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2201	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 2202	5322 121 40233	680NF	10	100	POLYESTER FOIL
C 2203	4822 121 50611	20NF		63	POLYSTYRENE FOIL
C 2204	4822 124 20467	15UF	-10+50	16	ELECTROLYTIC
C 2206	4822 122 30103	22NF	-20+80	40	CERAMIC PLATE
C 2301	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2302	5322 125 50051	18PF		300	TRIMMER
C 2303	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 2304	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2306	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2307	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 2308	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2309	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2311	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2312	4822 122 31054	10PF	2	100	CERAMIC PLATE
C 2313	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2314	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2316	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2317	4822 122 31058	15PF	2	100	CERAMIC PLATE
C 2318	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 2319	5322 125 50051	18PF		300	TRIMMER
C 2321	4822 122 31061	18PF	2	100	CERAMIC PLATE
C 2322	4822 122 30091	390PF	10	100	CERAMIC PLATE
C 2323	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2324	4822 122 30045	27PF	2	100	CERAMIC PLATE
C 2328	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2329	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2331	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2332	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2333	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2334	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2336	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2406	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2407	4822 122 30048	1,8NF	10	100	CERAMIC PLATE
C 2408	4822 122 30045	27PF	2	100	CERAMIC PLATE
C 2409	4822 122 30128	4,7NF	10	100	CERAMIC PLATE
C 2411	5322 125 50051	18PF		300	TRIMMER
C 2412	4822 122 31069	39PF	2	100	CERAMIC PLATE
C 2413	4822 122 30043	10NF	-20+80	40	CERAMIC PLATE
C 2414	4822 122 30055	330PF	10	100	CERAMIC PLATE

RESISTORS

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 1	5322 103 64016	5K	5	2W	WIRE-WOUND POTENTIOMETER
R 2	5322 101 44015	50K	20	CP16	CARBON POTM LIN + SWITCH
R 3	5322 101 44026	2x500	20	0,3W	CARBON POTM LIN + SWITCH
R 5	5322 101 44026	2x500	20	0,3W	CARBON POTM LIN + SWITCH
R 7	5322 101 44014	100K	20	CP16	CARBON POTM LIN + SWITCH
R 8	5322 101 44014	100K	20	CP16	CARBON POTM LIN + SWITCH
R 9	5322 101 54006	10K	20	0,1W	CARBON POTM LOG + SWITCH
R 10	5322 101 40041	4,7K	20	0.25W	CARBON POTM LIN + SWITCH
R 11	5322 101 40041	4,7K	20	0.25W	CARBON POTM LIN + SWITCH
R 12	5322 101 24099	10K	20	0,1W	CARBON POTM LIN
R 13	5322 101 34016	47K	20	0,1W	CARBON POTM LOG
R 14	5322 101 24055	25K	20	CP16	CARBON POTM LIN
R 15	5322 101 44027	10K	20	0,1W	CARBON POTM LIN + SWITCH
R 16	5322 101 24113	1M	20	0,1W	CARBON POTM LIN
R 17	5322 101 24112	47K	20	0,1W	CARBON POTM LIN
R 18	4822 101 20455	1K	20	0,1W	CARBON POTM LIN
R 101	5322 116 64048	56	5	0,125W	METAL OXIDE
R 102	5322 116 55021	920K	0,25	MR30	METAL FILM
R 103	5322 116 64052	39	5	0,125W	METAL OXIDE
R 104	5322 116 55067	88,9K	0,25	MR24C	METAL FILM
R 106	5322 116 64046	51	5	0,125W	METAL OXIDE
R 107	5322 116 54892	200K	0,25	MR25	METAL FILM
R 108	5322 116 64045	10	5	0,125W	METAL OXIDE
R 109	5322 116 64047	560	5	0,125W	METAL OXIDE
R 111	5322 116 64047	560	5	0,125W	METAL OXIDE
R 112	5322 116 64048	56	5	0,125W	METAL OXIDE
R 113	5322 116 55022	992K	0,25	MR30	METAL FILM
R 114	5322 116 64049	47	5	0,125W	METAL OXIDE
R 116	5322 116 55066	8,08K	0,25	MR24C	METAL FILM
R 117	5322 116 64051	15	5	0,125W	METAL OXIDE
R 118	5322 116 64051	15	5	0,125W	METAL OXIDE
R 119	5322 111 30376	100M	5	0,125W	CARBON
R 121	5322 116 50484	4,64K	1	MR25	METAL FILM
R 122	5322 116 54012	6,81K	1	MR25	METAL FILM
R 123	5322 116 54519	402	1	MR25	METAL FILM
R 124	5322 116 54208	210K	1	MR25	METAL FILM
R 126	5322 116 54774	590K	1	MR30	METAL FILM
R 127	5322 116 54038	221K	1	MR25	METAL FILM
R 128	4822 110 42214	10M	5	VR37	CARBON
R 129	5322 100 10143	1K	20	0,75W	TRIMMING POTM
R 131	5322 116 54208	210K	1	MR25	METAL FILM
R 132	5322 100 10141	10K	20	0,75W	TRIMMING POTM
R 133	5322 116 54689	82,5K	1	MR25	METAL FILM
R 134	4822 110 42227	33M	5	VR37	CARBON
R 139	5322 116 50672	51,1K	1	MR25	METAL FILM
R 141	5322 100 10141	10K	20	0,75W	TRIMMING POTM
R 148	5322 116 50592	442	1	MR25	METAL FILM
R 149	5322 116 50592	442	1	MR25	METAL FILM
R 301	5322 116 50524	3,01K	1	MR25	METAL FILM
R 302	5322 116 54508	301	1	MR25	METAL FILM
R 303	4822 111 30067	33	5	CR16	CARBON
R 304	5322 116 50524	3,01K	1	MR25	METAL FILM
R 306	4822 111 30347	10	5	CR16	CARBON
R 307	5322 116 50492	46,4	1	MR25	METAL FILM
R 308	5322 116 54464	86,6	1	MR25	METAL FILM
R 309	5322 116 34036	47	5	0,5W	NTC
R 311	5322 116 50492	46,4	1	MR25	METAL FILM
R 312	5322 116 50568	4,99	1	MR25	METAL FILM
R 313	5322 116 54464	86,6	1	MR25	METAL FILM
R 314	4822 111 30347	10	5	CR16	CARBON
R 316	4822 111 30067	33	5	CR16	CARBON
R 317	5322 116 50515	1,78K	1	MR25	METAL FILM
R 319	5322 116 54005	3,32K	1	MR25	METAL FILM
R 322	5322 116 50452	10	1	MR25	METAL FILM
R 323	5322 116 50571	715	1	MR25	METAL FILM
R 324	4822 111 30245	47	5	CR16	CARBON

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 326	4822 111 30067	33	5	CR16	CARBON
R 327	4822 111 30067	33	5	CR16	CARBON
R 328	5322 116 54576	2,37K	1	MR25	METAL FILM
R 329	5322 116 54587	3,65K	1	MR25	METAL FILM
R 331	4822 111 30067	33	5	CR16	CARBON
R 332	4822 111 30067	33	5	CR16	CARBON
R 333	5322 116 50571	715	1	MR25	METAL FILM
R 334	4822 111 30245	47	5	CR16	CARBON
R 336	5322 116 50452	10	1	MR25	METAL FILM
R 337	5322 116 50442	48,7K	1	MR25	METAL FILM
R 338	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 339	4822 111 30067	33	5	CR16	CARBON
R 341	5322 116 54492	178	1	MR25	METAL FILM
R 342	4822 110 63067	33	5	CR25	CARBON
R 343	4822 111 30067	33	5	CR16	CARBON
R 344	5322 116 54492	178	1	MR25	METAL FILM
R 346	4822 110 63067	33	5	CR25	CARBON
R 347	5322 116 54515	348	1	MR25	METAL FILM
R 348	5322 116 54005	3,32K	1	MR25	METAL FILM
R 349	4822 111 30067	33	5	CR16	CARBON
R 351	5322 116 54613	8,66K	1	MR25	METAL FILM
R 352	5322 116 50926	40,2	1	MR25	METAL FILM
R 353	5322 116 50926	40,2	1	MR25	METAL FILM
R 354	5322 116 50556	4,42K	1	MR25	METAL FILM
R 356	5322 100 10143	1K	20	0,75W	TRIMMING POTM
R 357	5322 116 54589	3,83K	1	MR25	METAL FILM
R 358	5322 116 54519	402	1	MR25	METAL FILM
R 359	5322 116 54012	6,81K	1	MR25	METAL FILM
R 361	5322 116 50483	38,3K	1	MR25	METAL FILM
R 362	5322 101 14048	47K	20	0,5W	TRIMMING POTM
R 363	4822 111 30067	33	5	CR16	CARBON
R 364	5322 116 50481	22,6K	1	MR25	METAL FILM
R 366	4822 111 30324	100	5	CR16	CARBON
R 367	5322 116 50452	10	1	MR25	METAL FILM
R 368	5322 116 50926	40,2	1	MR25	METAL FILM
R 369	5322 116 50926	40,2	1	MR25	METAL FILM
R 371	4822 111 30324	100	5	CR16	CARBON
R 372	5322 116 50527	33,2	1	MR25	METAL FILM
R 381	4822 111 30067	33	5	CR16	CARBON
R 382	5322 116 54513	332	1	MR25	METAL FILM
R 383	4822 111 30067	33	5	CR16	CARBON
R 384	5322 116 50555	1,27K	1	MR25	METAL FILM
R 386	5322 116 54592	4,02K	1	MR25	METAL FILM
R 387	5322 116 50515	1,78K	1	MR25	METAL FILM
R 388	5322 116 50581	2,49K	1	MR25	METAL FILM
R 389	4822 111 30067	33	5	CR16	CARBON
R 391	4822 111 30067	33	5	CR16	CARBON
R 392	4822 111 30067	33	5	CR16	CARBON
R 393	5322 116 54469	100	1	MR25	METAL FILM
R 394	4822 111 30067	33	5	CR16	CARBON
R 397	5322 116 54469	100	1	MR25	METAL FILM
R 398	5322 116 50621	536	1	MR25	METAL FILM
R 399	4822 111 30067	33	5	CR16	CARBON
R 401	5322 116 50524	3,01K	1	MR25	METAL FILM
R 402	5322 116 54613	8,66K	1	MR25	METAL FILM
R 403	4822 111 30067	33	5	CR16	CARBON
R 404	5322 116 54469	100	1	MR25	METAL FILM
R 413	4822 111 30324	100	5	CR16	CARBON
R 414	4822 111 30324	100	5	CR16	CARBON
R 416	4822 111 30067	33	5	CR16	CARBON
R 417	5322 116 54536	750	1	MR25	METAL FILM
R 418	5322 116 54536	750	1	MR25	METAL FILM
R 419	5322 116 54005	3,32K	1	MR25	METAL FILM
R 421	4822 111 30067	33	5	CR16	CARBON
R 422	5322 116 54608	7,5K	1	MR25	METAL FILM
R 423	5322 116 50492	46,4	1	MR25	METAL FILM
R 424	5322 116 50492	46,4	1	MR25	METAL FILM
R 426	5322 116 50675	2,26K	1	MR25	METAL FILM
R 428	5322 100 10143	1K	20	0,75W	TRIMMING POTM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 429	5322 116 50676	196	1	MR25	METAL FILM
R 431	5322 116 50676	196	1	MR25	METAL FILM
R 432	4822 111 30067	33	5	CR16	CARBON
R 433	4822 111 30067	33	5	CR16	CARBON
R 434	5322 116 54536	750	1	MR25	METAL FILM
R 436	5322 116 54536	750	1	MR25	METAL FILM
R 437	5322 116 54005	3,32K	1	MR25	METAL FILM
R 438	4822 111 30067	33	5	CR16	CARBON
R 439	5322 116 54608	7,5K	1	MR25	METAL FILM
R 441	5322 116 54561	1,33K	1	MR25	METAL FILM
R 442	5322 116 54504	274	1	MR25	METAL FILM
R 444	5322 116 54462	82,5	1	MR25	METAL FILM
R 446	5322 116 54504	274	1	MR25	METAL FILM
R 447	5322 116 50581	2,49K	1	MR25	METAL FILM
R 448	5322 116 54561	1,33K	1	MR25	METAL FILM
R 449	4822 111 30067	33	5	CR16	CARBON
R 501	5322 116 54442	51,1	1	MR25	METAL FILM
R 502	5322 116 54502	261	1	MR25	METAL FILM
R 503	5322 116 50452	10	1	MR25	METAL FILM
R 504	5322 116 50925	15,4	1	MR25	METAL FILM
R 506	5322 116 54502	261	1	MR25	METAL FILM
R 507	5322 116 54442	51,1	1	MR25	METAL FILM
R 508	5322 116 54492	178	1	MR25	METAL FILM
R 509	5322 116 54492	178	1	MR25	METAL FILM
R 511	4822 111 30067	33	5	CR16	CARBON
R 512	4822 111 30245	47	5	CR16	CARBON
R 513	4822 111 30067	33	5	CR16	CARBON
R 514	5322 116 50568	4,99	1	MR25	METAL FILM
R 516	5322 116 51052	42,2	1	MR25	METAL FILM
R 517	5322 116 51052	42,2	1	MR25	METAL FILM
R 518	4822 111 30067	33	5	CR16	CARBON
R 519	4822 111 30245	47	5	CR16	CARBON
R 521	5322 116 54561	1,33K	1	MR25	METAL FILM
R 522	5322 116 54561	1,33K	1	MR25	METAL FILM
R 523	4822 111 30067	33	5	CR16	CARBON
R 524	5322 116 54469	100	1	MR25	METAL FILM
R 531	5322 116 54128	5,62	1	MR25	METAL FILM
R 532	5322 116 50568	4,99	1	MR25	METAL FILM
R 533	5322 116 54258	9,53	1	MR25	METAL FILM
R 534	5322 116 50568	4,99	1	MR25	METAL FILM
R 536	5322 116 54258	9,53	1	MR25	METAL FILM
R 538	5322 116 54258	9,53	1	MR25	METAL FILM
R 539	5322 116 54258	9,53	1	MR25	METAL FILM
R 541	5322 116 54431	16,2	1	MR25	METAL FILM
R 542	5322 116 51051	8,66	1	MR25	METAL FILM
R 543	5322 116 51051	8,66	1	MR25	METAL FILM
R 601	5322 116 50926	40,2	1	MR25	METAL FILM
R 602	5322 116 54506	287	1	MR25	METAL FILM
R 603	4822 111 30067	33	5	CR16	CARBON
R 604	5322 116 54492	178	1	MR25	METAL FILM
R 606	5322 116 50676	196	1	MR25	METAL FILM
R 607	5322 116 54519	402	1	MR25	METAL FILM
R 608	4822 111 30067	33	5	CR16	CARBON
R 609	5322 116 54492	178	1	MR25	METAL FILM
R 610	5322 116 50524	3,01K	1	MR25	METAL FILM
R 611	5322 116 50926	40,2	1	MR25	METAL FILM
R 612	5322 116 54506	287	1	MR25	METAL FILM
R 613	5322 116 50506	154	1	MR25	METAL FILM
R 614	4822 111 30067	33	5	CR16	CARBON
R 615	5322 116 50524	3,01K	1	MR25	METAL FILM
R 616	5322 116 54444	53,6	1	MR25	METAL FILM
R 617	4822 111 30067	33	5	CR16	CARBON
R 618	5322 116 54444	53,6	1	MR25	METAL FILM
R 619	5322 101 14011	100	20	0,5W	TRIMMING POTM
R 621	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 622	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 623	5322 116 54613	8,66K	1	MR25	METAL FILM
R 624	5322 116 54619	10K	1	MR25	METAL FILM
R 627	4822 111 30245	47	5	CR16	CARBON

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 628	4822 111 30067	33	5	CR16	CARBON
R 629	5322 116 54608	7,5K	1	MR25	METAL FILM
R 630	4822 111 30067	33	5	CR16	CARBON
R 631	5322 116 50556	4,42K	1	MR25	METAL FILM
R 632	4822 111 30245	47	5	CR16	CARBON
R 633	4822 111 30067	33	5	CR16	CARBON
R 634	4822 111 30067	33	5	CR16	CARBON
R 636	4822 111 30067	33	5	CR16	CARBON
R 637	5322 116 50457	215	1	MR25	METAL FILM
R 638	5322 116 50669	205	1	MR25	METAL FILM
R 639	5322 116 54451	61,9	1	MR25	METAL FILM
R 641	5322 101 14047	470	20	0,5W	TRIMMING POTM
R 642	5322 116 50457	215	1	MR25	METAL FILM
R 644	5322 116 50669	205	1	MR25	METAL FILM
R 646	5322 116 54451	61,9	1	MR25	METAL FILM
R 647	4822 111 30067	33	5	CR16	CARBON
R 648	4822 111 30245	47	5	CR16	CARBON
R 649	5322 116 50515	1,78K	1	MR25	METAL FILM
R 650	5322 116 54615	9,09K	1	MR25	METAL FILM
R 651	5322 116 54585	3,48K	1	MR25	METAL FILM
R 652	5322 116 50474	42,2K	1	MR25	METAL FILM
R 653	5322 116 50417	162	1	MR25	METAL FILM
R 654	5322 116 54011	5,62K	1	MR25	METAL FILM
R 655	5322 116 50904	30,1	1	MR25	METAL FILM
R 656	5322 116 54557	1,21K	1	MR25	METAL FILM
R 657	5322 116 50579	3,16K	1	MR25	METAL FILM
R 658	5322 116 54516	365	1	MR25	METAL FILM
R 659	4822 111 30067	33	5	CR16	CARBON
R 660	5322 116 54516	365	1	MR25	METAL FILM
R 661	5322 116 50509	4,87K	1	MR25	METAL FILM
R 662	5322 116 50579	3,16K	1	MR25	METAL FILM
R 663	5322 116 54012	6,81K	1	MR25	METAL FILM
R 664	5322 116 54557	1,21K	1	MR25	METAL FILM
R 665	5322 116 54615	9,09K	1	MR25	METAL FILM
R 666	5322 116 54011	5,62K	1	MR25	METAL FILM
R 667	4822 111 30245	47	5	CR16	CARBON
R 668	5322 116 50515	1,78K	1	MR25	METAL FILM
R 669	5322 116 54585	3,48K	1	MR25	METAL FILM
R 671	5322 116 50474	42,2K	1	MR25	METAL FILM
R 672	5322 116 50417	162	1	MR25	METAL FILM
R 681	5322 116 50568	4,99	1	MR25	METAL FILM
R 682	5322 116 50568	4,99	1	MR25	METAL FILM
R 683	5322 116 50568	4,99	1	MR25	METAL FILM
R 684	5322 101 20408	100K	20	0,1W	CARBON POTM LIN
R 700	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 701	5322 116 50527	33,2	1	MR25	METAL FILM
R 702	5322 116 54263	681K	1	MR30	METAL FILM
R 703	5322 116 54549	1K	1	MR25	METAL FILM
R 704	5322 116 54549	1K	1	MR25	METAL FILM
R 705	5322 116 54595	5,11K	1	MR25	METAL FILM
R 706	5322 116 54743	301K	1	MR25	METAL FILM
R 707	5322 116 50527	33,2	1	MR25	METAL FILM
R 708	5322 116 50527	33,2	1	MR25	METAL FILM
R 709	5322 116 50527	33,2	1	MR25	METAL FILM
R 710	5322 116 54038	221K	1	MR25	METAL FILM
R 711	5322 116 50491	22,6	1	MR25	METAL FILM
R 712	5322 116 54619	10K	1	MR25	METAL FILM
R 713	5322 116 54624	11,5K	1	MR25	METAL FILM
R 714	5322 116 50527	33,2	1	MR25	METAL FILM
R 716	5322 116 50664	2,05K	1	MR25	METAL FILM
R 717	5322 116 54549	1K	1	MR25	METAL FILM
R 718	5322 116 54545	909	1	MR25	METAL FILM
R 719	5322 116 50527	33,2	1	MR25	METAL FILM
R 721	5322 116 50555	1,27K	1	MR25	METAL FILM
R 722	5322 116 54525	511	1	MR25	METAL FILM
R 723	5322 116 50527	33,2	1	MR25	METAL FILM
R 724	5322 116 50527	33,2	1	MR25	METAL FILM
R 726	5322 116 54549	1K	1	MR25	METAL FILM
R 727	5322 116 50527	33,2	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 728	5322 116 54469	100	1	MR25	METAL FILM
R 729	5322 116 50731	10,5K	1	MR25	METAL FILM
R 731	5322 116 50527	33,2	1	MR25	METAL FILM
R 732	5322 116 50527	33,2	1	MR25	METAL FILM
R 733	5322 116 50527	33,2	1	MR25	METAL FILM
R 734	5322 116 50731	10,5K	1	MR25	METAL FILM
R 751	5322 116 50527	33,2	1	MR25	METAL FILM
R 752	5322 116 54263	681K	1	MR30	METAL FILM
R 753	5322 116 54549	1K	1	MR25	METAL FILM
R 754	5322 116 54549	1K	1	MR25	METAL FILM
R 756	5322 116 54743	301K	1	MR25	METAL FILM
R 757	5322 116 50527	33,2	1	MR25	METAL FILM
R 758	5322 116 50527	33,2	1	MR25	METAL FILM
R 759	5322 116 50527	33,2	1	MR25	METAL FILM
R 760	5322 116 54038	221K	1	MR25	METAL FILM
R 761	5322 116 50491	22,6	1	MR25	METAL FILM
R 762	5322 116 54619	10K	1	MR25	METAL FILM
R 763	5322 116 54624	11,5K	1	MR25	METAL FILM
R 764	5322 116 50527	33,2	1	MR25	METAL FILM
R 766	5322 116 50664	2,05K	1	MR25	METAL FILM
R 768	5322 116 54545	909	1	MR25	METAL FILM
R 769	5322 116 50527	33,2	1	MR25	METAL FILM
R 771	5322 116 50555	1,27K	1	MR25	METAL FILM
R 772	5322 116 54525	511	1	MR25	METAL FILM
R 773	5322 116 50527	33,2	1	MR25	METAL FILM
R 774	5322 116 50527	33,2	1	MR25	METAL FILM
R 776	5322 116 54549	1K	1	MR25	METAL FILM
R 777	4822 110 63189	1,2M	10	CR25	CARBON
R 778	5322 116 54696	100K	1	MR25	METAL FILM
R 779	5322 116 50731	10,5K	1	MR25	METAL FILM
R 781	5322 116 50527	33,2	1	MR25	METAL FILM
R 784	5322 116 50731	10,5K	1	MR25	METAL FILM
R 801	4822 111 30324	100	5	CR16	CARBON
R 802	5322 111 30396	22	5	CR16	CARBON
R 803	5322 116 54012	6,81K	1	MR25	METAL FILM
R 804	4822 111 30263	3,3K	5	CR16	CARBON
R 806	5322 116 50586	1,54K	1	MR25	METAL FILM
R 807	5322 116 50895	18,7	1	MR25	METAL FILM
R 808	5322 116 50895	18,7	1	MR25	METAL FILM
R 809	5322 111 30396	22	5	CR16	CARBON
R 811	5322 116 54012	6,81K	1	MR25	METAL FILM
R 812	5322 116 54525	511	1	MR25	METAL FILM
R 813	5322 111 30396	22	5	CR16	CARBON
R 814	5322 116 54592	4,02K	1	MR25	METAL FILM
R 816	5322 111 30396	22	5	CR16	CARBON
R 817	5322 116 50415	1,15K	1	MR25	METAL FILM
R 818	5322 116 50415	1,15K	1	MR25	METAL FILM
R 819	5322 111 30396	22	5	CR16	CARBON
R 821	4822 110 63054	10	5	CR25	CARBON
R 822	5322 116 54683	68,1K	1	MR25	METAL FILM
R 823	5322 116 50636	2,74K	1	MR25	METAL FILM
R 824	5322 116 54683	68,1K	1	MR25	METAL FILM
R 826	5322 116 54552	1,05K	1	MR25	METAL FILM
R 827	5322 116 50635	1,47K	1	MR25	METAL FILM
R 828	5322 116 50635	1,47K	1	MR25	METAL FILM
R 829	5322 116 54552	1,05K	1	MR25	METAL FILM
R 831	5322 111 30396	22	5	CR16	CARBON
R 832	5322 111 30396	22	5	CR16	CARBON
R 833	5322 116 50527	33,2	1	MR25	METAL FILM
R 834	5322 116 50506	154	1	MR25	METAL FILM
R 836	5322 116 54508	301	1	MR25	METAL FILM
R 837	5322 116 54552	1,05K	1	MR25	METAL FILM
R 838	5322 111 30396	22	5	CR16	CARBON
R 839	5322 116 54552	1,05K	1	MR25	METAL FILM
R 840	5322 111 30396	22	5	CR16	CARBON
R 841	5322 116 54576	2,37K	1	MR25	METAL FILM
R 842	5322 116 54519	402	1	MR25	METAL FILM
R 843	4822 110 63054	10	5	CR25	CARBON
R 844	4822 110 63054	10	5	CR25	CARBON

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 851	4822 110 63036	2,2	5	CR25	CARBON
R 852	4822 110 63036	2,2	5	CR25	CARBON
R 853	4822 110 63036	2,2	5	CR25	CARBON
R 854	4822 110 63036	2,2	5	CR25	CARBON
R 856	5322 116 54564	1,5K	1	MR25	METAL FILM
R 857	5322 111 44156	510	5	CR16	CARBON
R 858	5322 116 54549	1K	1	MR25	METAL FILM
R 859	5322 116 54619	10K	1	MR25	METAL FILM
R 861	5322 116 54629	14K	1	MR25	METAL FILM
R 862	5322 111 34094	620	5	CR16	CARBON
R 863	4822 111 30303	8,2K	5	CR16	CARBON
R 864	4822 111 30267	1,5K	5	CR16	CARBON
R 866	4822 111 30119	3K	5	CR16	CARBON
R 867	5322 116 50561	590	1	MR25	METAL FILM
R 868	5322 116 54011	5,62K	1	MR25	METAL FILM
R 869	5322 116 54585	3,48K	1	MR25	METAL FILM
R 871	5322 111 44153	15	5	CR16	CARBON
R 872	5322 116 54474	110	1	MR25	METAL FILM
R 873	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 874	5322 116 54661	34,8K	1	MR25	METAL FILM
R 876	5322 116 54619	10K	1	MR25	METAL FILM
R 877	5322 116 54597	5,36K	1	MR25	METAL FILM
R 878	5322 116 50415	1,15K	1	MR25	METAL FILM
R 879	5322 116 54481	130	1	MR25	METAL FILM
R 880	5322 116 54585	3,48K	1	MR25	METAL FILM
R 881	5322 116 50676	196	1	MR25	METAL FILM
R 882	5322 116 54696	100K	1	MR25	METAL FILM
R 883	5322 116 54632	14,7K	1	MR25	METAL FILM
R 884	5322 116 54632	14,7K	1	MR25	METAL FILM
R 885	5322 116 50583	5,9K	1	MR25	METAL FILM
R 886	5322 116 50481	22,6K	1	MR25	METAL FILM
R 887	5322 116 50459	422	1	MR25	METAL FILM
R 888	5322 116 54005	3,32K	1	MR25	METAL FILM
R 889	5322 116 54603	6,49K	1	MR25	METAL FILM
R 890	5322 116 50527	33,2	1	MR25	METAL FILM
R 891	5322 116 50675	2,26K	1	MR25	METAL FILM
R 892	5322 116 54608	7,5K	1	MR25	METAL FILM
R 893	4822 111 30067	33	5	CR16	CARBON
R 894	5322 116 50509	4,87K	1	MR25	METAL FILM
R 895	5322 116 50586	1,54K	1	MR25	METAL FILM
R 897	5322 116 54519	402	1	MR25	METAL FILM
R 898	5322 116 54534	681	1	MR25	METAL FILM
R 899	5322 116 50636	2,74K	1	MR25	METAL FILM
R 900	4822 111 30067	33	5	CR16	CARBON
R 901	5322 116 54549	1K	1	MR25	METAL FILM
R 902	4822 111 30067	33	5	CR16	CARBON
R 903	5322 116 50527	33,2	1	MR25	METAL FILM
R 904	5322 116 50636	2,74K	1	MR25	METAL FILM
R 905	5322 116 54587	3,65K	1	MR25	METAL FILM
R 906	5322 111 30396	22	5	CR16	CARBON
R 907	5322 116 50556	4,42K	1	MR25	METAL FILM
R 908	4822 111 30067	33	5	CR16	CARBON
R 909	5322 116 50798	898	0,5	MR24C	METAL FILM
R 910	5322 116 54549	1K	1	MR25	METAL FILM
R 911	5322 116 50579	3,16K	1	MR25	METAL FILM
R 912	5322 116 50556	4,42K	1	MR25	METAL FILM
R 913	5322 116 50664	2,05K	1	MR25	METAL FILM
R 914	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 915	5322 116 54624	11,5K	1	MR25	METAL FILM
R 916	5322 116 50481	22,6K	1	MR25	METAL FILM
R 917	5322 116 54549	1K	1	MR25	METAL FILM
R 918	5322 116 54549	1K	1	MR25	METAL FILM
R 919	5322 116 50559	27,4K	1	MR25	METAL FILM
R 921	5322 116 50559	27,4K	1	MR25	METAL FILM
R 922	5322 116 50556	4,42K	1	MR25	METAL FILM
R 923	5322 116 50556	4,42K	1	MR25	METAL FILM
R 925	5322 116 54619	10K	1	MR25	METAL FILM
R 926	5322 116 54011	5,62K	1	MR25	METAL FILM
R 927	5322 116 54011	5,62K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 928	5322 111 30396	22	5	CR16	CARBON
R 929	5322 116 54627	13,3K	1	MR25	METAL FILM
R 931	4822 111 30352	82	5	CR16	CARBON
R 932	4822 111 30245	47	5	CR16	CARBON
R 933	5322 111 30396	22	5	CR16	CARBON
R 934	5322 111 30279	33K	5	CR16	CARBON
R 936	5322 116 54565	1,62K	1	MR25	METAL FILM
R 937	5322 111 44156	510	5	CR16	CARBON
R 939	5322 111 44156	510	5	CR16	CARBON
R 941	4822 111 30327	220	5	CR16	CARBON
R 942	5322 116 54632	14,7K	1	MR25	METAL FILM
R 944	5322 116 50664	2,05K	1	MR25	METAL FILM
R 946	5322 116 54608	7,5K	1	MR25	METAL FILM
R 948	5322 116 54617	9,53K	1	MR25	METAL FILM
R 949	5322 116 54576	2,37K	1	MR25	METAL FILM
R 961	5322 116 54408	909K	1	MR30	METAL FILM
R 962	5322 116 54762	365K	1	MR30	METAL FILM
R 963	5322 116 54939	35,2K	0,5	MR24C	METAL FILM
R 964	5322 116 55167	17,2K	0,5	MR24C	METAL FILM
R 966	5322 116 55168	8,16K	0,5	MR24C	METAL FILM
R 967	5322 116 54832	2,71K	0,5	MR24C	METAL FILM
R 968	5322 116 50798	898	0,5	MR24C	METAL FILM
R 969	5322 116 54722	182K	1	MR25	METAL FILM
R 971	5322 116 54977	89,8K	0,5	MR24C	METAL FILM
R 976	5322 116 50527	33,2	1	MR25	METAL FILM
R 977	5322 116 50729	4,22K	1	MR25	METAL FILM
R 978	5322 116 50451	21,5K	1	MR25	METAL FILM
R 979	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 981	5322 116 54005	3,32K	1	MR25	METAL FILM
R 982	5322 116 50527	33,2	1	MR25	METAL FILM
R 983	5322 116 50484	4,64K	1	MR25	METAL FILM
R 984	5322 116 50664	2,05K	1	MR25	METAL FILM
R 986	5322 116 54595	5,11K	1	MR25	METAL FILM
R 987	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 1001	4822 111 30324	100	5	CR16	CARBON
R 1002	5322 111 30396	22	5	CR16	CARBON
R 1003	5322 116 54012	6,81K	1	MR25	METAL FILM
R 1004	4822 111 30263	3,3K	5	CR16	CARBON
R 1006	5322 116 50586	1,54K	1	MR25	METAL FILM
R 1007	5322 116 50895	18,7	1	MR25	METAL FILM
R 1008	5322 116 50895	18,7	1	MR25	METAL FILM
R 1009	5322 111 30396	22	5	CR16	CARBON
R 1011	5322 116 54012	6,81K	1	MR25	METAL FILM
R 1012	5322 116 54525	511	1	MR25	METAL FILM
R 1013	5322 111 30396	22	5	CR16	CARBON
R 1014	5322 116 54592	4,02K	1	MR25	METAL FILM
R 1016	5322 111 30396	22	5	CR16	CARBON
R 1017	5322 116 50415	1,15K	1	MR25	METAL FILM
R 1018	5322 116 50415	1,15K	1	MR25	METAL FILM
R 1019	5322 111 30396	22	5	CR16	CARBON
R 1021	4822 110 63054	10	5	CR25	CARBON
R 1022	5322 116 54683	68,1K	1	MR25	METAL FILM
R 1023	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1024	5322 116 54683	68,1K	1	MR25	METAL FILM
R 1026	5322 116 54552	1,05K	1	MR25	METAL FILM
R 1027	5322 116 50635	1,47K	1	MR25	METAL FILM
R 1028	5322 116 50635	1,47K	1	MR25	METAL FILM
R 1029	5322 116 54552	1,05K	1	MR25	METAL FILM
R 1031	5322 111 30396	22	5	CR16	CARBON
R 1032	5322 111 30396	22	5	CR16	CARBON
R 1033	5322 116 50527	33,2	1	MR25	METAL FILM
R 1034	5322 116 50506	154	1	MR25	METAL FILM
R 1036	5322 116 54508	301	1	MR25	METAL FILM
R 1037	5322 116 54552	1,05K	1	MR25	METAL FILM
R 1038	5322 111 30396	22	5	CR16	CARBON
R 1039	5322 116 54552	1,05K	1	MR25	METAL FILM
R 1040	5322 111 30396	22	5	CR16	CARBON
R 1041	5322 116 54576	2,37K	1	MR25	METAL FILM
R 1042	5322 116 54519	402	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 1043	4822 110 63054	10	5	CR25	CARBON
R 1044	4822 110 63054	10	5	CR25	CARBON
R 1051	4822 110 63036	2,2	5	CR25	CARBON
R 1052	4822 110 63036	2,2	5	CR25	CARBON
R 1053	4822 110 63063	22	5	CR25	CARBON
R 1054	4822 110 63036	2,2	5	CR25	CARBON
R 1055	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1056	5322 116 54576	2,37K	1	MR25	METAL FILM
R 1057	5322 116 54525	511	1	MR25	METAL FILM
R 1058	5322 116 54474	110	1	MR25	METAL FILM
R 1059	5322 111 44153	15	5	CR16	CARBON
R 1061	5322 116 54532	649	1	MR25	METAL FILM
R 1062	5322 116 50729	4,22K	1	MR25	METAL FILM
R 1063	5322 116 54011	5,62K	1	MR25	METAL FILM
R 1064	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 1065	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1066	5322 116 54629	14K	1	MR25	METAL FILM
R 1067	5322 116 54597	5,36K	1	MR25	METAL FILM
R 1068	5322 116 54597	5,36K	1	MR25	METAL FILM
R 1069	5322 116 50415	1,15K	1	MR25	METAL FILM
R 1070	5322 116 54516	365	1	MR25	METAL FILM
R 1071	5322 116 54648	24,9K	1	MR25	METAL FILM
R 1072	5322 116 54519	402	1	MR25	METAL FILM
R 1073	5322 116 54545	909	1	MR25	METAL FILM
R 1074	5322 116 50664	2,05K	1	MR25	METAL FILM
R 1075	5322 111 30396	22	5	CR16	CARBON
R 1076	5322 116 54597	5,36K	1	MR25	METAL FILM
R 1077	5322 116 54005	3,32K	1	MR25	METAL FILM
R 1078	5322 116 54603	6,49K	1	MR25	METAL FILM
R 1079	5322 116 50767	2,15K	1	MR25	METAL FILM
R 1080	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 1081	4822 111 30067	33	5	CR16	CARBON
R 1082	5322 116 54608	7,5K	1	MR25	METAL FILM
R 1083	5322 116 54635	16,9K	1	MR25	METAL FILM
R 1084	4822 111 30067	33	5	CR16	CARBON
R 1085	5322 116 50481	22,6K	1	MR25	METAL FILM
R 1086	5322 116 50798	898	0,5	MR24C	METAL FILM
R 1087	4822 111 30067	33	5	CR16	CARBON
R 1088	5322 116 50579	3,16K	1	MR25	METAL FILM
R 1089	5322 116 50527	33,2	1	MR25	METAL FILM
R 1090	5322 116 54549	1K	1	MR25	METAL FILM
R 1091	4822 111 30067	33	5	CR16	CARBON
R 1092	5322 116 54587	3,65K	1	MR25	METAL FILM
R 1093	5322 116 50556	4,42K	1	MR25	METAL FILM
R 1094	5322 116 54595	5,11K	1	MR25	METAL FILM
R 1095	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1096	5322 116 50479	15,4K	1	MR25	METAL FILM
R 1097	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 1098	5322 116 54549	1K	1	MR25	METAL FILM
R 1099	5322 111 30278	27K	5	CR16	CARBON
R 1101	4822 111 30352	82	5	CR16	CARBON
R 1102	4822 111 30245	47	5	CR16	CARBON
R 1103	5322 111 30396	22	5	CR16	CARBON
R 1104	5322 111 30396	22	5	CR16	CARBON
R 1106	5322 111 30279	33K	5	CR16	CARBON
R 1107	5322 116 54565	1,62K	1	MR25	METAL FILM
R 1108	5322 116 54576	2,37K	1	MR25	METAL FILM
R 1109	5322 116 50514	64,9K	1	MR25	METAL FILM
R 1111	5322 116 54595	5,11K	1	MR25	METAL FILM
R 1112	5322 116 50586	1,54K	1	MR25	METAL FILM
R 1113	5322 116 54576	2,37K	1	MR25	METAL FILM
R 1114	5322 116 54557	1,21K	1	MR25	METAL FILM
R 1115	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 1116	5322 116 54469	100	1	MR25	METAL FILM
R 1117	5322 116 54561	1,33K	1	MR25	METAL FILM
R 1118	5322 116 54576	2,37K	1	MR25	METAL FILM
R 1119	5322 116 54617	9,53K	1	MR25	METAL FILM
R 1121	5322 116 54561	1,33K	1	MR25	METAL FILM
R 1122	5322 116 50524	3,01K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 1123	5322 116 54561	1,33K	1	MR25	METAL FILM
R 1124	4822 111 30067	33	5	CR16	CARBON
R 1126	4822 111 30067	33	5	CR16	CARBON
R 1127	5322 116 54617	9,53K	1	MR25	METAL FILM
R 1128	5322 116 50583	5,9K	1	MR25	METAL FILM
R 1129	5322 116 54592	4,02K	1	MR25	METAL FILM
R 1131	5322 116 54641	19,6K	1	MR25	METAL FILM
R 1132	5322 116 54663	37,4K	1	MR25	METAL FILM
R 1162	5322 116 54762	365K	1	MR30	METAL FILM
R 1163	5322 116 54939	35,2K	0,5	MR24C	METAL FILM
R 1164	5322 116 55167	17,2K	0,5	MR24C	METAL FILM
R 1166	5322 116 55168	8,16K	0,5	MR24C	METAL FILM
R 1167	5322 116 54832	2,71K	0,5	MR24C	METAL FILM
R 1168	5322 116 50798	898	0,5	MR24C	METAL FILM
R 1169	5322 116 54722	182K	1	MR25	METAL FILM
R 1171	5322 116 54977	89,8K	0,5	MR24C	METAL FILM
R 1201	5322 116 54558	8,25K	1	MR25	METAL FILM
R 1202	5322 116 50479	15,4K	1	MR25	METAL FILM
R 1203	5322 116 50484	4,64K	1	MR25	METAL FILM
R 1204	4822 111 30067	33	5	CR16	CARBON
R 1206	5322 116 54619	10K	1	MR25	METAL FILM
R 1207	5322 116 54576	2,37K	1	MR25	METAL FILM
R 1208	5322 116 54619	10K	1	MR25	METAL FILM
R 1209	5322 101 14008	2,2K	20	0,5W	TRIMMING POTM
R 1211	5322 116 50621	536	1	MR25	METAL FILM
R 1212	5322 116 50635	1,47K	1	MR25	METAL FILM
R 1213	5322 116 50621	536	1	MR25	METAL FILM
R 1214	5322 116 50511	48,7	1	MR25	METAL FILM
R 1216	5322 116 50457	215	1	MR25	METAL FILM
R 1217	4822 111 30333	1M	10	CR16	CARBON
R 1218	4822 111 30333	1M	10	CR16	CARBON
R 1219	5322 116 54619	10K	1	MR25	METAL FILM
R 1221	5322 116 50511	48,7	1	MR25	METAL FILM
R 1222	5322 116 50579	3,16K	1	MR25	METAL FILM
R 1223	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 1224	5322 116 50579	3,16K	1	MR25	METAL FILM
R 1225	5322 116 50728	1,87K	1	MR25	METAL FILM
R 1226	5322 116 54615	9,09K	1	MR25	METAL FILM
R 1227	5322 116 54541	825	1	MR25	METAL FILM
R 1228	5322 116 54541	825	1	MR25	METAL FILM
R 1229	4822 111 30067	33	5	CR16	CARBON
R 1231	5322 116 50583	5,9K	1	MR25	METAL FILM
R 1232	5322 116 54012	6,81K	1	MR25	METAL FILM
R 1233	5322 116 50555	1,27K	1	MR25	METAL FILM
R 1234	5322 116 54716	162K	1	MR25	METAL FILM
R 1236	4822 111 30067	33	5	CR16	CARBON
R 1237	5322 116 50481	22,6K	1	MR25	METAL FILM
R 1238	4822 111 30067	33	5	CR16	CARBON
R 1239	5322 116 54549	1K	1	MR25	METAL FILM
R 1241	5322 116 54336	475K	1	MR30	METAL FILM
R 1242	5322 116 50481	22,6K	1	MR25	METAL FILM
R 1243	4822 111 30067	33	5	CR16	CARBON
R 1244	5322 116 50451	21,5K	1	MR25	METAL FILM
R 1246	5322 116 54592	4,02K	1	MR25	METAL FILM
R 1247	5322 116 50579	3,16K	1	MR25	METAL FILM
R 1248	4822 111 30067	33	5	CR16	CARBON
R 1249	5322 116 50481	22,6K	1	MR25	METAL FILM
R 1251	5322 116 50481	22,6K	1	MR25	METAL FILM
R 1252	5322 116 54549	1K	1	MR25	METAL FILM
R 1253	5322 116 54188	1M	1	MR30	METAL FILM
R 1254	4822 111 30067	33	5	CR16	CARBON
R 1256	5322 116 54716	162K	1	MR25	METAL FILM
R 1257	4822 111 30067	33	5	CR16	CARBON
R 1258	5322 116 50555	1,27K	1	MR25	METAL FILM
R 1302	5322 116 54655	30,1K	1	MR25	METAL FILM
R 1303	5322 116 50414	2,87K	1	MR25	METAL FILM
R 1304	5322 116 50479	15,4K	1	MR25	METAL FILM
R 1306	5322 116 54627	13,3K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 1307	5322 116 50479	15,4K	1	MR25	METAL FILM
R 1308	5322 116 50492	46,4	1	MR25	METAL FILM
R 1309	5322 116 50479	15,4K	1	MR25	METAL FILM
R 1310	5322 116 55165	4,64K	1	MR30	METAL FILM
R 1311	5322 116 50491	22,6	1	MR25	METAL FILM
R 1312	4822 110 63187	1M	5	CR25	CARBON
R 1313	5322 116 54696	100K	1	MR25	METAL FILM
R 1314	5322 116 50559	27,4K	1	MR25	METAL FILM
R 1316	5322 116 50536	464	1	MR25	METAL FILM
R 1317	5322 116 54619	10K	1	MR25	METAL FILM
R 1318	5322 116 50559	27,4K	1	MR25	METAL FILM
R 1319	5322 116 50536	464	1	MR25	METAL FILM
R 1320	5322 116 54469	100	1	MR25	METAL FILM
R 1321	5322 116 50668	11,3K	1	MR25	METAL FILM
R 1322	5322 116 54561	1,33K	1	MR25	METAL FILM
R 1323	5322 116 50557	46,4K	1	MR25	METAL FILM
R 1324	5322 116 50668	11,3K	1	MR25	METAL FILM
R 1325	5322 116 54469	100	1	MR25	METAL FILM
R 1326	5322 116 50524	3,01K	1	MR25	METAL FILM
R 1327	5322 116 54627	13,3K	1	MR25	METAL FILM
R 1328	5322 116 50492	46,4	1	MR25	METAL FILM
R 1329	5322 101 14008	2,2K	20	0,5W	TRIMMING POTM
R 1330	5322 116 50664	2,05K	1	MR25	METAL FILM
R 1331	5322 116 54549	1K	1	MR25	METAL FILM
R 1332	4822 110 63187	1M	5	CR25	CARBON
R 1333	4822 110 63187	1M	5	CR25	CARBON
R 1334	5322 116 54469	100	1	MR25	METAL FILM
R 1335	4822 110 63161	100K	5	CR25	CARBON
R 1336	4822 110 42194	1,8M	5	VR37	CARBON
R 1337	4822 110 42203	3,9M	5	VR37	CARBON
R 1338	5322 101 14094	1M	20	0,5W	TRIMMING POTM
R 1339	5322 116 54738	274K	1	MR25	METAL FILM
R 1341	5322 101 14142	220K	20	0,5W	TRIMMING POTM
R 1342	5322 116 54716	162K	1	MR25	METAL FILM
R 1343	5322 116 54686	75K	1	MR25	METAL FILM
R 1344	5322 101 14142	220K	20	0,5W	TRIMMING POTM
R 1345	4822 116 30041	4	10	1W	NTC
R 1346	5322 116 50559	27,4K	1	MR25	METAL FILM
R 1350	4822 116 30041	4	10	1W	NTC
R 1356	5322 116 50559	27,4K	1	MR25	METAL FILM
R 1357	5322 116 50559	27,4K	1	MR25	METAL FILM
R 1358	5322 116 54005	3,32K	1	MR25	METAL FILM
R 1359	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 1361	5322 116 54005	3,32K	1	MR25	METAL FILM
R 1366	5322 116 54647	24,3K	1	MR25	METAL FILM
R 1367	5322 116 54003	22,1K	1	MR25	METAL FILM
R 1373	5322 116 54685	71,5K	1	MR25	METAL FILM
R 1374	5322 116 50731	10,5K	1	MR25	METAL FILM
R 1376	5322 116 54706	127K	1	MR25	METAL FILM
R 1377	5322 116 50664	2,05K	1	MR25	METAL FILM
R 1386	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 1387	5322 116 50675	2,26K	1	MR25	METAL FILM
R 1388	5322 116 50675	2,26K	1	MR25	METAL FILM
R 1389	5322 116 54549	1K	1	MR25	METAL FILM
R 1390	5322 100 10112	1K	20	0,5W	TRIMMING POTM
R 1391	5322 116 50492	46,4	1	MR25	METAL FILM
R 1392	5322 116 50492	46,4	1	MR25	METAL FILM
R 1393	5322 116 50492	46,4	1	MR25	METAL FILM
R 1394	5322 116 50515	1,78K	1	MR25	METAL FILM
R 1396	5322 116 50415	1,15K	1	MR25	METAL FILM
R 1397	5322 116 50492	46,4	1	MR25	METAL FILM
R 1398	5322 116 50579	3,16K	1	MR25	METAL FILM
R 1399	5322 116 50635	1,47K	1	MR25	METAL FILM
R 1401	5322 116 50492	46,4	1	MR25	METAL FILM
R 1402	5322 116 50557	46,4K	1	MR25	METAL FILM
R 1403	5322 116 54549	1K	1	MR25	METAL FILM
R 1404	5322 116 50491	22,6	1	MR25	METAL FILM
R 1406	5322 116 50492	46,4	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 1407	5322 116 54462	82,5	1	MR25	METAL FILM
R 1408	5322 116 54005	3,32K	1	MR25	METAL FILM
R 1409	5322 116 54493	182	1	MR25	METAL FILM
R 1411	5322 116 50671	2,61K	1	MR25	METAL FILM
R 1412	5322 116 54462	82,5	1	MR25	METAL FILM
R 1413	5322 116 50491	22,6	1	MR25	METAL FILM
R 1414	5322 116 50491	22,6	1	MR25	METAL FILM
R 1416	5322 116 54643	20,5K	1	MR25	METAL FILM
R 1417	5322 116 54426	121	1	MR25	METAL FILM
R 1418	5322 116 50451	21,5K	1	MR25	METAL FILM
R 1419	5322 116 54508	301	1	MR25	METAL FILM
R 1421	5322 116 50524	3,01K	1	MR25	METAL FILM
R 1422	5322 116 54534	681	1	MR25	METAL FILM
R 1423	5322 116 50524	3,01K	1	MR25	METAL FILM
R 1424	5322 116 50586	1,54K	1	MR25	METAL FILM
R 1426	5322 116 54492	178	1	MR25	METAL FILM
R 1427	5322 116 51052	42,2	1	MR25	METAL FILM
R 1428	5322 116 54508	301	1	MR25	METAL FILM
R 1429	5322 116 50571	715	1	MR25	METAL FILM
R 1501	5322 116 54665	40,2K	1	MR25	METAL FILM
R 1502	5322 116 50442	48,7K	1	MR25	METAL FILM
R 1503	5322 116 54683	68,1K	1	MR25	METAL FILM
R 1504	5322 116 50474	42,2K	1	MR25	METAL FILM
R 1506	5322 116 54549	1K	1	MR25	METAL FILM
R 1507	5322 116 54655	30,1K	1	MR25	METAL FILM
R 1508	5322 116 54632	14,7K	1	MR25	METAL FILM
R 1509	5322 116 50672	51,1K	1	MR25	METAL FILM
R 1516	5322 116 64015	7,5M	5	VR68	METAL OXIDE
R 1517	5322 116 64053	12M	5	VR68	METAL OXIDE
R 1518	4822 110 42187	1M	5	VR37	CARBON
R 1601	5322 116 54466	90,9	1	MR25	METAL FILM
R 1602	5322 116 54466	90,9	1	MR25	METAL FILM
R 1603	5322 116 50417	162	1	MR25	METAL FILM
R 1604	5322 116 50675	2,26K	1	MR25	METAL FILM
R 1606	5322 116 50675	2,26K	1	MR25	METAL FILM
R 1607	5322 116 50586	1,54K	1	MR25	METAL FILM
R 1608	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1609	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1610	5322 116 54525	511	1	MR25	METAL FILM
R 1611	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1612	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1613	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1614	5322 116 50636	2,74K	1	MR25	METAL FILM
R 1616	5322 116 54557	1,21K	1	MR25	METAL FILM
R 1617	5322 116 54557	1,21K	1	MR25	METAL FILM
R 1618	5322 116 50568	4,99	1	MR25	METAL FILM
R 1619	5322 116 50452	10	1	MR25	METAL FILM
R 1626	5322 116 54595	5,11K	1	MR25	METAL FILM
R 1627	5322 116 54587	3,65K	1	MR25	METAL FILM
R 1628	5322 116 54099	8,25	1	MR25	METAL FILM
R 1629	5322 116 54635	16,9K	1	MR25	METAL FILM
R 1630	5322 116 54455	68,1	1	MR25	METAL FILM
R 1631	5322 116 54606	7,15K	1	MR25	METAL FILM
R 1632	5322 116 54606	7,15K	1	MR25	METAL FILM
R 1633	5322 116 54648	24,9K	1	MR25	METAL FILM
R 1634	5322 116 54549	1K	1	MR25	METAL FILM
R 1636	5322 116 54648	24,9K	1	MR25	METAL FILM
R 1637	5322 116 54587	3,65K	1	MR25	METAL FILM
R 1638	5322 116 54455	68,1	1	MR25	METAL FILM
R 1642	5322 116 54099	8,25	1	MR25	METAL FILM
R 1646	5322 116 54595	5,11K	1	MR25	METAL FILM
R 1647	5322 116 54587	3,65K	1	MR25	METAL FILM
R 1648	5322 116 54099	8,25	1	MR25	METAL FILM
R 1649	5322 116 54635	16,9K	1	MR25	METAL FILM
R 1650	5322 116 54455	68,1	1	MR25	METAL FILM
R 1651	5322 116 54606	7,15K	1	MR25	METAL FILM
R 1652	5322 116 54606	7,15K	1	MR25	METAL FILM
R 1653	5322 116 54648	24,9K	1	MR25	METAL FILM
R 1654	5322 116 54549	1K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 1656	5322 116 54648	24,9K	1	MR25	METAL FILM
R 1657	5322 116 54587	3,65K	1	MR25	METAL FILM
R 1658	5322 116 54455	68,1	1	MR25	METAL FILM
R 1662	5322 116 54099	8,25	1	MR25	METAL FILM
R 1802	4822 110 53029	1,2	5	CR37	CARBON
R 1803	5322 116 54743	301K	1	MR25	METAL FILM
R 1804	5322 116 54743	301K	1	MR25	METAL FILM
R 1805	5322 116 55149	24,9K	1	MR30	METAL FILM
R 1806	4822 110 63214	10M	10	CR25	CARBON
R 1807	4822 110 63196	2,2M	10	CR25	CARBON
R 1808	5322 116 54426	121	1	MR25	METAL FILM
R 1809	5322 116 54549	1K	1	MR25	METAL FILM
R 1810	5322 116 50557	46,4K	1	MR25	METAL FILM
R 1811	4822 112 21054	10	5	4,2W	WIRE-WOUND
R 1812	5322 116 54549	1K	1	MR25	METAL FILM
R 1813	5322 116 54619	10K	1	MR25	METAL FILM
R 1814	4822 110 53054	10	5	0,5W	CARBON
R 1815	5322 116 34028	150K	5	0,5W	NTC
R 1817	5322 116 50442	48,7K	1	MR25	METAL FILM
R 1818	5322 116 54965	82	5	PR52	METAL FILM
R 1819	5322 116 54619	10K	1	MR25	METAL FILM
R 1820	5322 116 54549	1K	1	MR25	METAL FILM
R 1821	5322 116 54549	1K	1	MR25	METAL FILM
R 1822	5322 116 50731	10,5K	1	MR25	METAL FILM
R 1823	5322 116 54529	619	1	MR25	METAL FILM
R 1824	5322 116 54549	1K	1	MR25	METAL FILM
R 1825	5322 116 54469	100	1	MR25	METAL FILM
R 1826	5322 116 54574	2,21K	1	MR25	METAL FILM
R 1827	5322 116 54558	8,25K	1	MR25	METAL FILM
R 1828	5322 100 10115	1K	20	0,5W	TRIMMING POTM
R 1829	5322 116 50586	1,54K	1	MR25	METAL FILM
R 1830	5322 116 50669	205	1	MR25	METAL FILM
R 1831	5322 116 54558	8,25K	1	MR25	METAL FILM
R 1832	5322 116 50664	2,05K	1	MR25	METAL FILM
R 1833	5322 116 54906	75	1	MR30	METAL FILM
R 1834	5322 116 54619	10K	1	MR25	METAL FILM
R 1835	5322 116 54014	23,7	1	MR25	METAL FILM
R 1836	5322 116 50559	27,4K	1	MR25	METAL FILM
R 1837	5322 116 54696	100K	1	MR25	METAL FILM
R 1838	4822 110 63187	1M	5	CR25	CARBON
R 1839	5322 116 54648	24,9K	1	MR25	METAL FILM
R 1840	5322 116 54192	5,1	5	CR25	METAL FILM
R 1841	5322 116 54469	100	1	MR25	METAL FILM
R 1842	5322 116 54469	100	1	MR25	METAL FILM
R 1843	5322 116 54738	274K	1	MR25	METAL FILM
R 1844	5322 116 54619	10K	1	MR25	METAL FILM
R 1845	4822 110 63045	4,7	5	CR25	CARBON
R 1846	5322 116 54726	200K	1	MR25	METAL FILM
R 1847	5322 116 54726	200K	1	MR25	METAL FILM
R 1848	5322 116 54525	511	1	MR25	METAL FILM
R 1849	5322 116 55097	47	5	PR37	METAL FILM
R 1851		22	20	0,5W	TRIMMING POTM
R 1852	5322 116 54069	12,1	1	MR25	METAL FILM
R 1853	5322 116 54069	12,1	1	MR25	METAL FILM
R 1857	5322 116 54696	100K	1	MR25	METAL FILM
R 1858	5322 116 50904	30,1	1	MR25	METAL FILM
R 1881	4822 112 21114	1,8K	5	4,2W	WIRE-WOUND
R 1882	5322 116 54648	24,9K	1	MR25	METAL FILM
R 1883	5322 116 54516	365	1	MR25	METAL FILM
R 1884	5322 116 54469	100	1	MR25	METAL FILM
R 1901	5322 116 50767	2,15K	1	MR25	METAL FILM
R 1902	5322 116 54589	3,83K	1	MR25	METAL FILM
R 1903	4822 111 30067	33	5	CR16	CARBON
R 1904	4822 111 30067	33	5	CR16	CARBON
R 1906	4822 111 30067	33	5	CR16	CARBON
R 1907	4822 111 30067	33	5	CR16	CARBON
R 1908	4822 111 30067	33	5	CR16	CARBON
R 1909	4822 111 30067	33	5	CR16	CARBON
R 1911	5322 116 50442	48,7K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 1912	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 1913	5322 116 50608	6,19K	1	MR25	METAL FILM
R 1914	5322 116 50608	6,19K	1	MR25	METAL FILM
R 1916	5322 116 50479	15,4K	1	MR25	METAL FILM
R 1917	5322 116 50479	15,4K	1	MR25	METAL FILM
R 1918	5322 116 50608	6,19K	1	MR25	METAL FILM
R 1919	5322 116 50608	6,19K	1	MR25	METAL FILM
R 1921	4822 111 30067	33	5	CR16	CARBON
R 1923	5322 116 54502	261	1	MR25	METAL FILM
R 1924	5322 116 54502	261	1	MR25	METAL FILM
R 1926	5322 116 54009	562	1	MR25	METAL FILM
R 1927	5322 116 50568	4,99	1	MR25	METAL FILM
R 1928	5322 116 54453	64,9	1	MR25	METAL FILM
R 1929	5322 116 54444	53,6	1	MR25	METAL FILM
R 1931	5322 100 10143	1K	20	0,75W	TRIMMING POTM
R 1932	5322 116 54453	64,9	1	MR25	METAL FILM
R 1933	5322 116 54444	53,6	1	MR25	METAL FILM
R 1934	5322 116 50555	1,27K	1	MR25	METAL FILM
R 1936	4822 111 30067	33	5	CR16	CARBON
R 1937	5322 116 54561	1,33K	1	MR25	METAL FILM
R 1938	5322 116 50731	10,5K	1	MR25	METAL FILM
R 1941	4822 111 30067	33	5	CR16	CARBON
R 1942	4822 111 30245	47	5	CR16	CARBON
R 1943	5322 116 54519	402	1	MR25	METAL FILM
R 1944	5322 116 50452	10	1	MR25	METAL FILM
R 1946	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 1947	5322 116 50442	48,7K	1	MR25	METAL FILM
R 1948	5322 116 54554	1,1K	1	MR25	METAL FILM
R 1949	5322 116 50452	10	1	MR25	METAL FILM
R 1951	4822 111 30245	47	5	CR16	CARBON
R 1952	5322 116 54549	1K	1	MR25	METAL FILM
R 1953	4822 111 30067	33	5	CR16	CARBON
R 1954	5322 116 54571	1,96K	1	MR25	METAL FILM
R 1956	4822 111 30067	33	5	CR16	CARBON
R 1957	5322 116 54617	9,53K	1	MR25	METAL FILM
R 1958	5322 116 50581	2,49K	1	MR25	METAL FILM
R 1959	5322 116 50452	10	1	MR25	METAL FILM
R 1960	4822 111 30067	33	5	CR16	CARBON
R 1961	5322 116 54519	402	1	MR25	METAL FILM
R 1962	4822 111 30245	47	5	CR16	CARBON
R 1963	5322 116 54554	1,1K	1	MR25	METAL FILM
R 1964	4822 111 30245	47	5	CR16	CARBON
R 1966	5322 116 50452	10	1	MR25	METAL FILM
R 1967	4822 111 30067	33	5	CR16	CARBON
R 1968	5322 116 54619	10K	1	MR25	METAL FILM
R 1969	5322 116 54571	1,96K	1	MR25	METAL FILM
R 1971	4822 111 30067	33	5	CR16	CARBON
R 1972	5322 116 54538	787	1	MR25	METAL FILM
R 1973	4822 111 30067	33	5	CR16	CARBON
R 1974	4822 111 30067	33	5	CR16	CARBON
R 2001	5322 116 50527	33,2	1	MR25	METAL FILM
R 2002	5322 100 10143	1K	20	0,75W	TRIMMING POTM
R 2006	5322 116 54476	115	1	MR25	METAL FILM
R 2007	5322 116 54444	53,6	1	MR25	METAL FILM
R 2008	5322 100 10112	1K	20	0,5W	TRIMMING POTM
R 2009	5322 116 54476	115	1	MR25	METAL FILM
R 2011	5322 116 54444	53,6	1	MR25	METAL FILM
R 2012	5322 116 50527	33,2	1	MR25	METAL FILM
R 2013	4822 111 30067	33	5	CR16	CARBON
R 2014	5322 116 50635	1,47K	1	MR25	METAL FILM
R 2016	5322 116 50635	1,47K	1	MR25	METAL FILM
R 2017	4822 111 30067	33	5	CR16	CARBON
R 2018	4822 111 30245	47	5	CR16	CARBON
R 2019	5322 116 54494	187	1	MR25	METAL FILM
R 2021	5322 116 54549	1K	1	MR25	METAL FILM
R 2022	5322 116 54536	750	1	MR25	METAL FILM
R 2023	4822 111 30067	33	5	CR16	CARBON
R 2024	4822 111 30067	33	5	CR16	CARBON

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 2025	5322 116 54565	1,62K	1	MR25	METAL FILM
R 2026	5322 116 50586	1,54K	1	MR25	METAL FILM
R 2027	5322 116 54497	226	1	MR25	METAL FILM
R 2028	4822 111 30067	33	5	CR16	CARBON
R 2029	5322 116 54549	1K	1	MR25	METAL FILM
R 2031	5322 116 54549	1K	1	MR25	METAL FILM
R 2032	5322 116 50586	1,54K	1	MR25	METAL FILM
R 2033	4822 111 30067	33	5	CR16	CARBON
R 2034	5322 116 54504	274	1	MR25	METAL FILM
R 2036	4822 111 30245	47	5	CR16	CARBON
R 2037	5322 116 54595	5,11K	1	MR25	METAL FILM
R 2038	4822 111 30067	33	5	CR16	CARBON
R 2039	5322 116 50592	442	1	MR25	METAL FILM
R 2041	5322 116 50492	46,4	1	MR25	METAL FILM
R 2042	5322 116 54513	332	1	MR25	METAL FILM
R 2043	5322 116 54536	750	1	MR25	METAL FILM
R 2044	4822 111 30067	33	5	CR16	CARBON
R 2101	5322 116 54469	100	1	MR25	METAL FILM
R 2102	5322 116 50482	33,2K	1	MR25	METAL FILM
R 2103	5322 116 54469	100	1	MR25	METAL FILM
R 2104	4822 110 63196	2,2M	10	CR25	CARBON
R 2106	5322 116 50479	15,4K	1	MR25	METAL FILM
R 2107	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 2108	5322 116 54655	30,1K	1	MR25	METAL FILM
R 2109	5322 116 50484	4,64K	1	MR25	METAL FILM
R 2111	5322 116 54732	237K	1	MR25	METAL FILM
R 2112	4822 110 60184	750K	5	CR25	CARBON
R 2113	5322 116 54619	10K	1	MR25	METAL FILM
R 2114	5322 116 50586	1,54K	1	MR25	METAL FILM
R 2116	5322 116 54712	147K	1	MR25	METAL FILM
R 2117	5322 116 50636	2,74K	1	MR25	METAL FILM
R 2118	5322 116 50415	1,15K	1	MR25	METAL FILM
R 2119	5322 116 54549	1K	1	MR25	METAL FILM
R 2121	5322 116 50481	22,6K	1	MR25	METAL FILM
R 2122	5322 116 54592	4,02K	1	MR25	METAL FILM
R 2123	5322 116 50664	2,05K	1	MR25	METAL FILM
R 2124	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 2126	5322 116 54619	10K	1	MR25	METAL FILM
R 2127	5322 116 54008	4,75K	1	MR25	METAL FILM
R 2128	5322 101 14008	2,2K	20	0,5W	TRIMMING POTM
R 2129	5322 116 54674	53,6K	1	MR25	METAL FILM
R 2131	5322 101 14142	220K	20	0,5W	TRIMMING POTM
R 2132	5322 116 54629	14K	1	MR25	METAL FILM
R 2133	5322 116 54696	100K	1	MR25	METAL FILM
R 2134	5322 116 50664	2,05K	1	MR25	METAL FILM
R 2136	5322 116 54696	100K	1	MR25	METAL FILM
R 2137	5322 116 54661	34,8K	1	MR25	METAL FILM
R 2138	5322 116 54661	34,8K	1	MR25	METAL FILM
R 2139	5322 116 54674	53,6K	1	MR25	METAL FILM
R 2140	5322 116 54549	1K	1	MR25	METAL FILM
R 2141	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 2142	5322 116 54661	34,8K	1	MR25	METAL FILM
R 2143	5322 116 54743	301K	1	MR25	METAL FILM
R 2144	5322 116 54696	100K	1	MR25	METAL FILM
R 2146	5322 116 54469	100	1	MR25	METAL FILM
R 2147	5322 116 50729	4,22K	1	MR25	METAL FILM
R 2148	5322 116 54549	1K	1	MR25	METAL FILM
R 2149	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 2151	5322 116 50571	715	1	MR25	METAL FILM
R 2153	5322 116 50556	4,42K	1	MR25	METAL FILM
R 2154	5322 116 54696	100K	1	MR25	METAL FILM
R 2156	5322 116 54671	47,5K	1	MR25	METAL FILM
R 2157	5322 116 50536	464	1	MR25	METAL FILM
R 2158	5322 116 54732	237K	1	MR25	METAL FILM
R 2159	4822 110 60184	750K	5	CR25	CARBON
R 2161	5322 116 54619	10K	1	MR25	METAL FILM
R 2162	5322 116 54619	10K	1	MR25	METAL FILM
R 2163	5322 116 54595	5,11K	1	MR25	METAL FILM
R 2164	5322 116 54595	5,11K	1	MR25	METAL FILM

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 2166	4822 110 63178	470K	5	CR25	CARBON
R 2167	5322 101 14142	220K	20	0,5W	TRIMMING POTM
R 2168	5322 101 14069	22K	20	0,5W	TRIMMING POTM
R 2169	5322 116 54005	3,32K	1	MR25	METAL FILM
R 2170	5322 116 54008	4,75K	1	MR25	METAL FILM
R 2171	5322 116 54005	3,32K	1	MR25	METAL FILM
R 2172	5322 116 54006	392	1	MR25	METAL FILM
R 2173	5322 116 54649	25,5K	1	MR25	METAL FILM
R 2178	5322 116 54008	4,75K	1	MR25	METAL FILM
R 2179	5322 116 54661	34,8K	1	MR25	METAL FILM
R 2181	5322 116 54696	100K	1	MR25	METAL FILM
R 2182	5322 116 54619	10K	1	MR25	METAL FILM
R 2183	5322 116 54629	14K	1	MR25	METAL FILM
R 2184	5322 116 54006	392	1	MR25	METAL FILM
R 2186	5322 116 50452	10	1	MR25	METAL FILM
R 2187	5322 116 50442	48,7K	1	MR25	METAL FILM
R 2188	5322 116 50572	12,1K	1	MR25	METAL FILM
R 2189	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 2191	5322 116 50572	12,1K	1	MR25	METAL FILM
R 2192	5322 116 50442	48,7K	1	MR25	METAL FILM
R 2193	5322 116 50593	16,2K	1	MR25	METAL FILM
R 2194	5322 116 50593	16,2K	1	MR25	METAL FILM
R 2196	5322 116 54655	30,1K	1	MR25	METAL FILM
R 2197	5322 116 55164	22,6K	1	MR30	METAL FILM
R 2198	5322 116 54549	1K	1	MR25	METAL FILM
R 2199	5322 116 54549	1K	1	MR25	METAL FILM
R 2201	5322 116 54469	100	1	MR25	METAL FILM
R 2202	5322 116 54639	19,1K	1	MR25	METAL FILM
R 2203	5322 116 50608	6,19K	1	MR25	METAL FILM
R 2204	5322 116 54502	261	1	MR25	METAL FILM
R 2206	5322 116 50608	6,19K	1	MR25	METAL FILM
R 2207	5322 116 54469	100	1	MR25	METAL FILM
R 2208	5322 116 54533	665	1	MR25	METAL FILM
R 2209	5322 100 10114	4,7K	20	0,5W	TRIMMING POTM
R 2211	5322 116 54576	2,37K	1	MR25	METAL FILM
R 2212	5322 116 54524	499	1	MR25	METAL FILM
R 2301	5322 116 50524	3,01K	1	MR25	METAL FILM
R 2302	5322 116 54508	301	1	MR25	METAL FILM
R 2303	4822 111 30067	33	5	CR16	CARBON
R 2304	5322 116 50524	3,01K	1	MR25	METAL FILM
R 2306	4822 111 30347	10	5	CR16	CARBON
R 2307	5322 116 50492	46,4	1	MR25	METAL FILM
R 2308	5322 116 54464	86,6	1	MR25	METAL FILM
R 2309	5322 116 34036	47	5	0,5W	NTC
R 2311	5322 116 50492	46,4	1	MR25	METAL FILM
R 2312	5322 116 50568	4,99	1	MR25	METAL FILM
R 2313	5322 116 54464	86,6	1	MR25	METAL FILM
R 2314	4822 111 30347	10	5	CR16	CARBON
R 2316	4822 111 30067	33	5	CR16	CARBON
R 2317	5322 116 50515	1,78K	1	MR25	METAL FILM
R 2319	5322 116 54005	3,32K	1	MR25	METAL FILM
R 2322	5322 116 50452	10	1	MR25	METAL FILM
R 2323	5322 116 50571	715	1	MR25	METAL FILM
R 2324	4822 111 30245	47	5	CR16	CARBON
R 2326	4822 111 30067	33	5	CR16	CARBON
R 2327	4822 111 30067	33	5	CR16	CARBON
R 2328	5322 116 54576	2,37K	1	MR25	METAL FILM
R 2329	5322 116 54587	3,65K	1	MR25	METAL FILM
R 2331	4822 111 30067	33	5	CR16	CARBON
R 2332	4822 111 30067	33	5	CR16	CARBON
R 2333	5322 116 50571	715	1	MR25	METAL FILM
R 2334	4822 111 30245	47	5	CR16	CARBON
R 2336	5322 116 50452	10	1	MR25	METAL FILM
R 2337	5322 116 50442	48,7K	1	MR25	METAL FILM
R 2338	5322 100 10113	10K	20	0,5W	TRIMMING POTM
R 2339	4822 111 30067	33	5	CR16	CARBON
R 2341	5322 116 54492	178	1	MR25	METAL FILM
R 2342	4822 110 63067	33	5	CR25	CARBON
R 2343	4822 111 30067	33	5	CR16	CARBON

ITEM	ORDERING NUMBER	OHM	TOL (%)	TYPE	REMARKS
R 2344	5322 116 54492	178	1	MR25	METAL FILM
R 2346	4822 110 63067	33	5	CR25	CARBON
R 2347	5322 116 54515	348	1	MR25	METAL FILM
R 2348	5322 116 54005	3,32K	1	MR25	METAL FILM
R 2349	4822 111 30067	33	5	CR16	CARBON
R 2351	5322 116 54613	8,66K	1	MR25	METAL FILM
R 2352	5322 116 50926	40,2	1	MR25	METAL FILM
R 2353	5322 116 50926	40,2	1	MR25	METAL FILM
R 2354	5322 116 50556	4,42K	1	MR25	METAL FILM
R 2356	5322 100 10143	1K	20	0,75W	TRIMMING POTM
R 2357	5322 116 54589	3,83K	1	MR25	METAL FILM
R 2358	5322 116 54519	402	1	MR25	METAL FILM
R 2359	5322 116 54012	6,81K	1	MR25	METAL FILM
R 2361	5322 116 50483	38,3K	1	MR25	METAL FILM
R 2362	5322 101 14048	47K	20	0,5W	TRIMMING POTM
R 2363	4822 111 30067	33	5	CR16	CARBON
R 2364	5322 116 50481	22,6K	1	MR25	METAL FILM
R 2366	4822 111 30324	100	5	CR16	CARBON
R 2367	5322 116 50452	10	1	MR25	METAL FILM
R 2368	5322 116 50926	40,2	1	MR25	METAL FILM
R 2369	5322 116 50926	40,2	1	MR25	METAL FILM
R 2371	4822 111 30324	100	5	CR16	CARBON
R 2372	5322 116 50527	33,2	1	MR25	METAL FILM
R 2373	5322 116 54585	3,48K	1	MR25	METAL FILM
R 2374	5322 116 50581	2,49K	1	MR25	METAL FILM
R 2375	4822 111 30067	33	5	CR16	CARBON
R 2376	5322 116 54585	3,48K	1	MR25	METAL FILM
R 2377	5322 116 54585	3,48K	1	MR25	METAL FILM
R 2378	5322 116 50581	2,49K	1	MR25	METAL FILM
R 2379	5322 116 54585	3,48K	1	MR25	METAL FILM
R 2380	4822 111 30067	33	5	CR16	CARBON
R 2381	5322 116 50527	33,2	1	MR25	METAL FILM
R 2391	4822 111 30067	33	5	CR16	CARBON
R 2392	4822 111 30067	33	5	CR16	CARBON
R 2393	5322 116 54469	100	1	MR25	METAL FILM
R 2394	4822 111 30067	33	5	CR16	CARBON
R 2397	5322 116 54469	100	1	MR25	METAL FILM
R 2398	5322 116 50621	536	1	MR25	METAL FILM
R 2399	4822 111 30067	33	5	CR16	CARBON
R 2401	5322 116 50524	3,01K	1	MR25	METAL FILM
R 2402	5322 116 54613	8,66K	1	MR25	METAL FILM
R 2404	5322 116 54469	100	1	MR25	METAL FILM
R 2413	4822 111 30324	100	5	CR16	CARBON
R 2414	4822 111 30324	100	5	CR16	CARBON
R 2416	4822 111 30067	33	5	CR16	CARBON
R 2417	5322 116 54536	750	1	MR25	METAL FILM
R 2418	5322 116 54536	750	1	MR25	METAL FILM
R 2419	5322 116 54005	3,32K	1	MR25	METAL FILM
R 2421	4822 111 30067	33	5	CR16	CARBON
R 2422	5322 116 54608	7,5K	1	MR25	METAL FILM
R 2423	5322 116 50492	46,4	1	MR25	METAL FILM
R 2424	5322 116 50492	46,4	1	MR25	METAL FILM
R 2426	5322 116 50675	2,26K	1	MR25	METAL FILM
R 2427	5322 116 50414	2,87K	1	MR25	METAL FILM
R 2428	5322 100 10143	1K	20	0,75W	TRIMMING POTM
R 2429	5322 116 50676	196	1	MR25	METAL FILM
R 2431	5322 116 50676	196	1	MR25	METAL FILM
R 2432	4822 111 30067	33	5	CR16	CARBON
R 2433	4822 111 30067	33	5	CR16	CARBON
R 2434	5322 116 54536	750	1	MR25	METAL FILM
R 2436	5322 116 54536	750	1	MR25	METAL FILM
R 2437	5322 116 54005	3,32K	1	MR25	METAL FILM
R 2438	4822 111 30067	33	5	CR16	CARBON
R 2439	5322 116 54608	7,5K	1	MR25	METAL FILM
R 2441	5322 116 54561	1,33K	1	MR25	METAL FILM
R 2442	5322 116 54504	274	1	MR25	METAL FILM
R 2444	5322 116 54462	82,5	1	MR25	METAL FILM
R 2446	5322 116 54504	274	1	MR25	METAL FILM
R 2447	5322 116 50581	2,49K	1	MR25	METAL FILM
R 2448	5322 116 54561	1,33K	1	MR25	METAL FILM
R 2449	4822 111 30067	33	5	CR16	CARBON

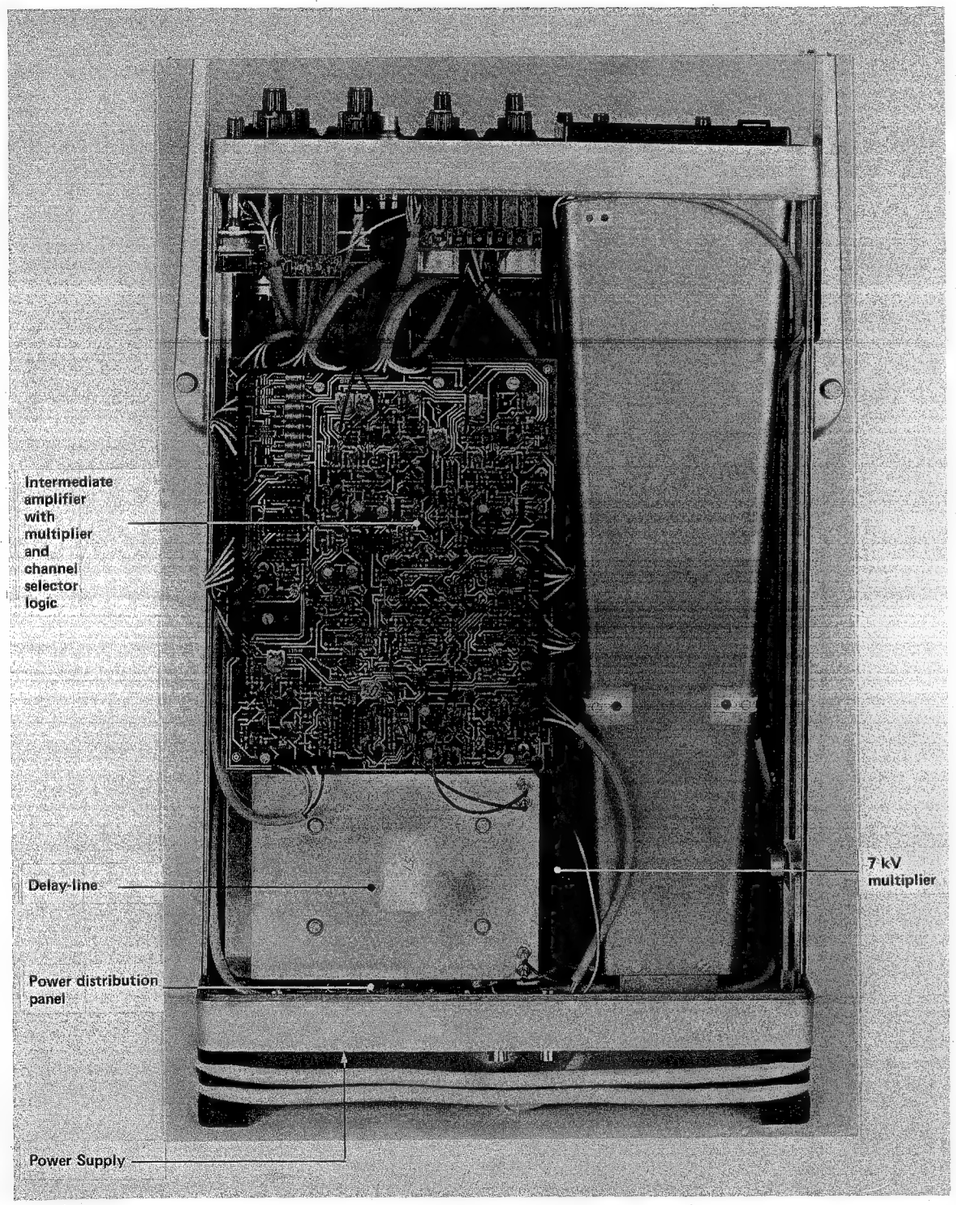


Fig. 3.15. Unit location, top view

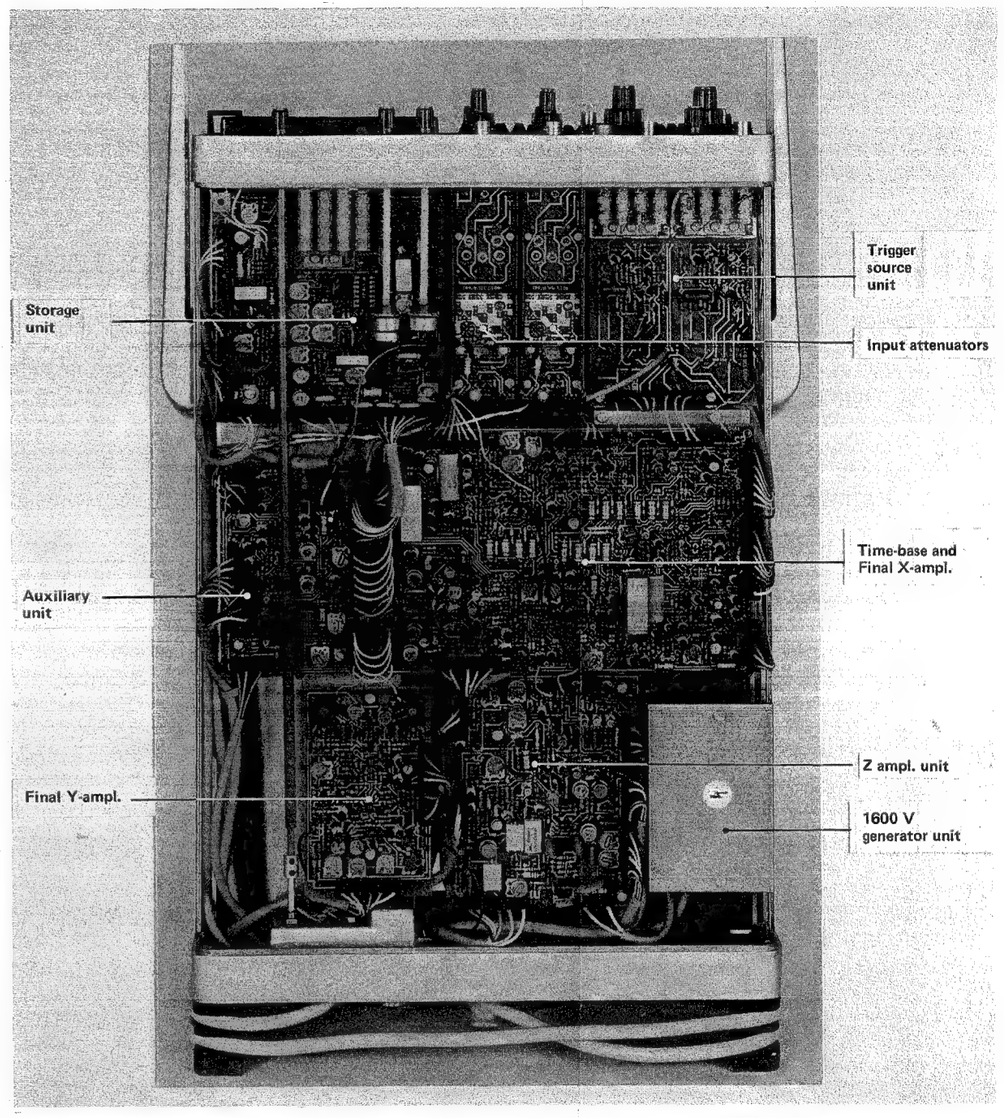


Fig. 3.16. Unit location, bottom view

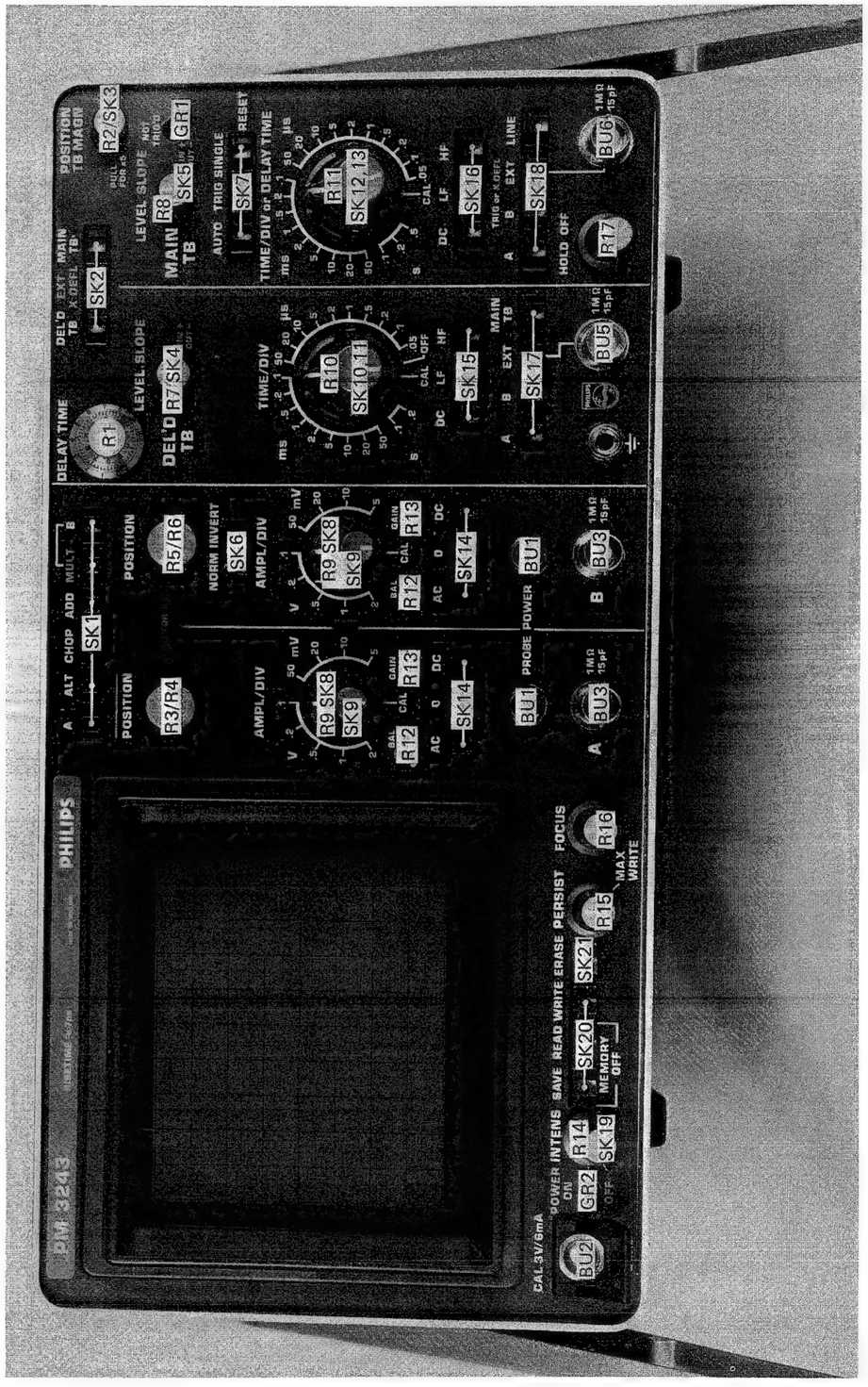


Fig. 3.17. Electrical item numbers, front plate

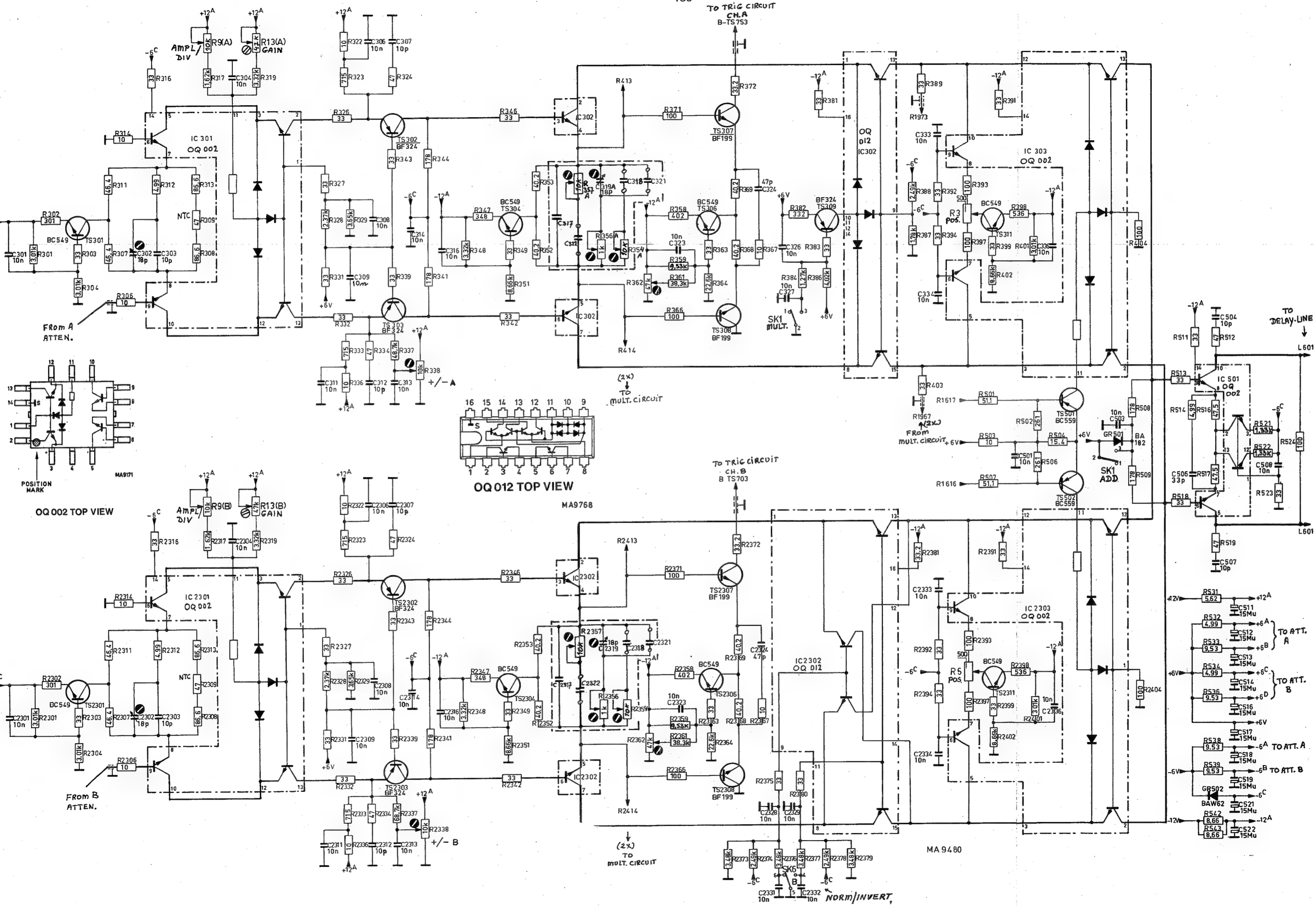


Fig. 3.20. Circuit diagram intermediate amplifier

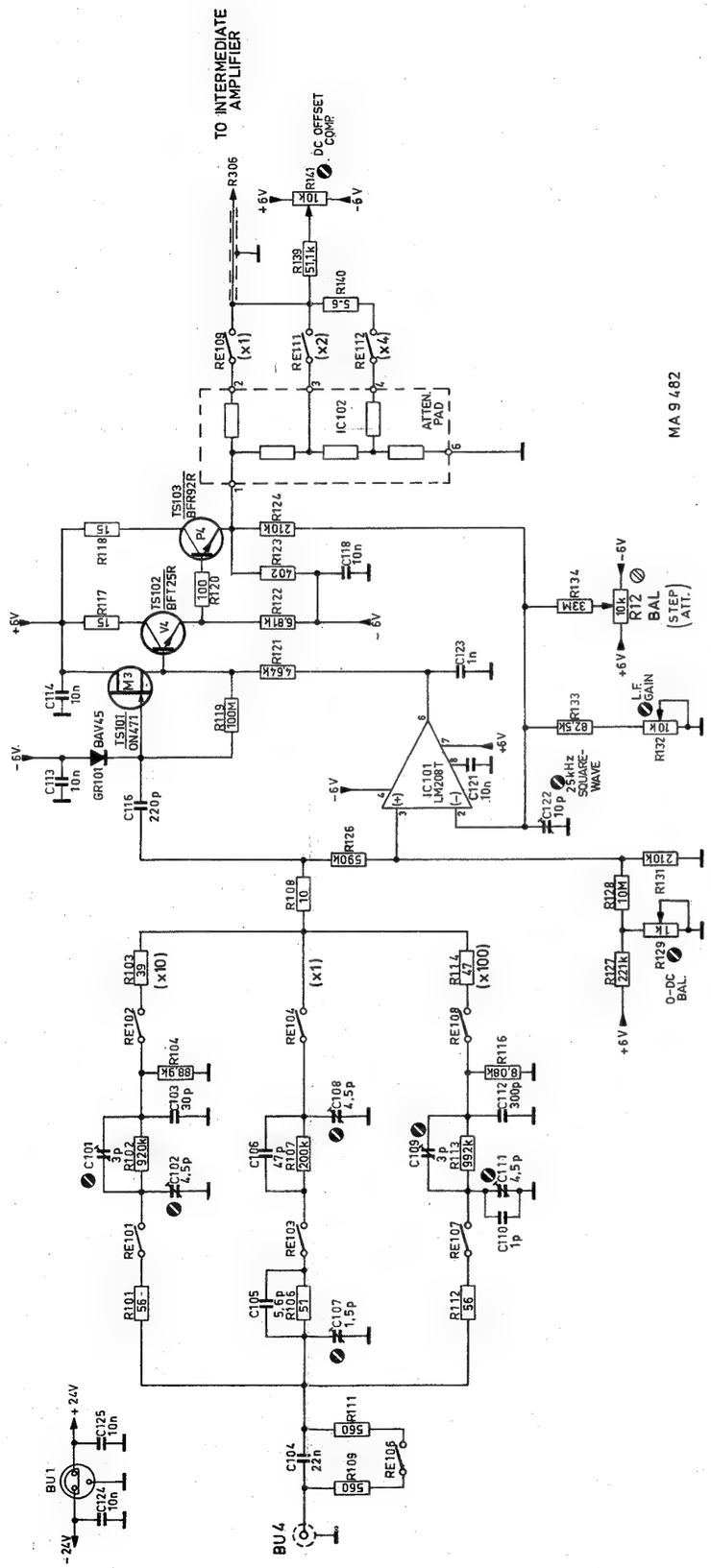


Fig. 3.18. Circuit diagram attenuator

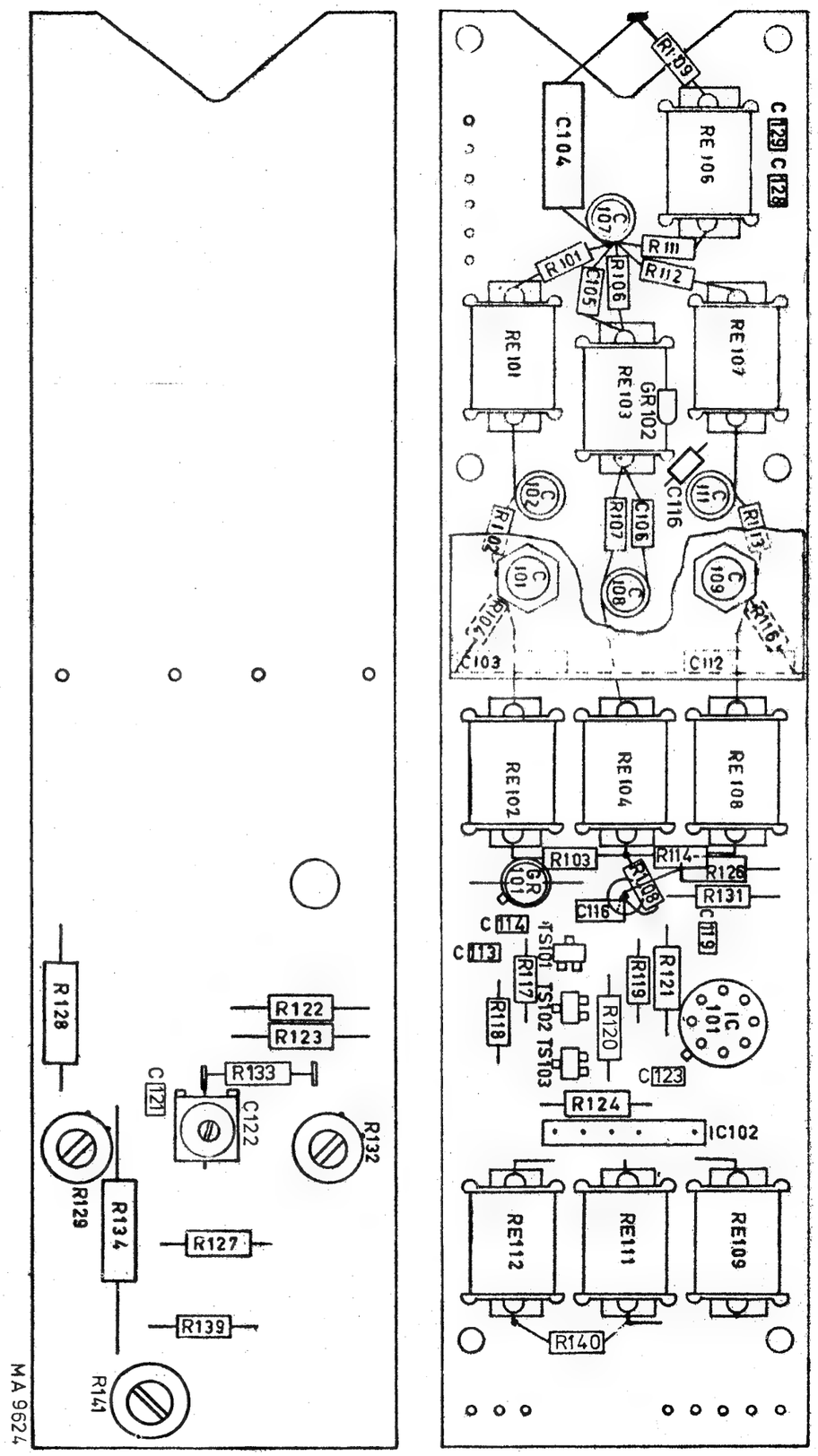


Fig. 3.19. Component lay-out attenuator

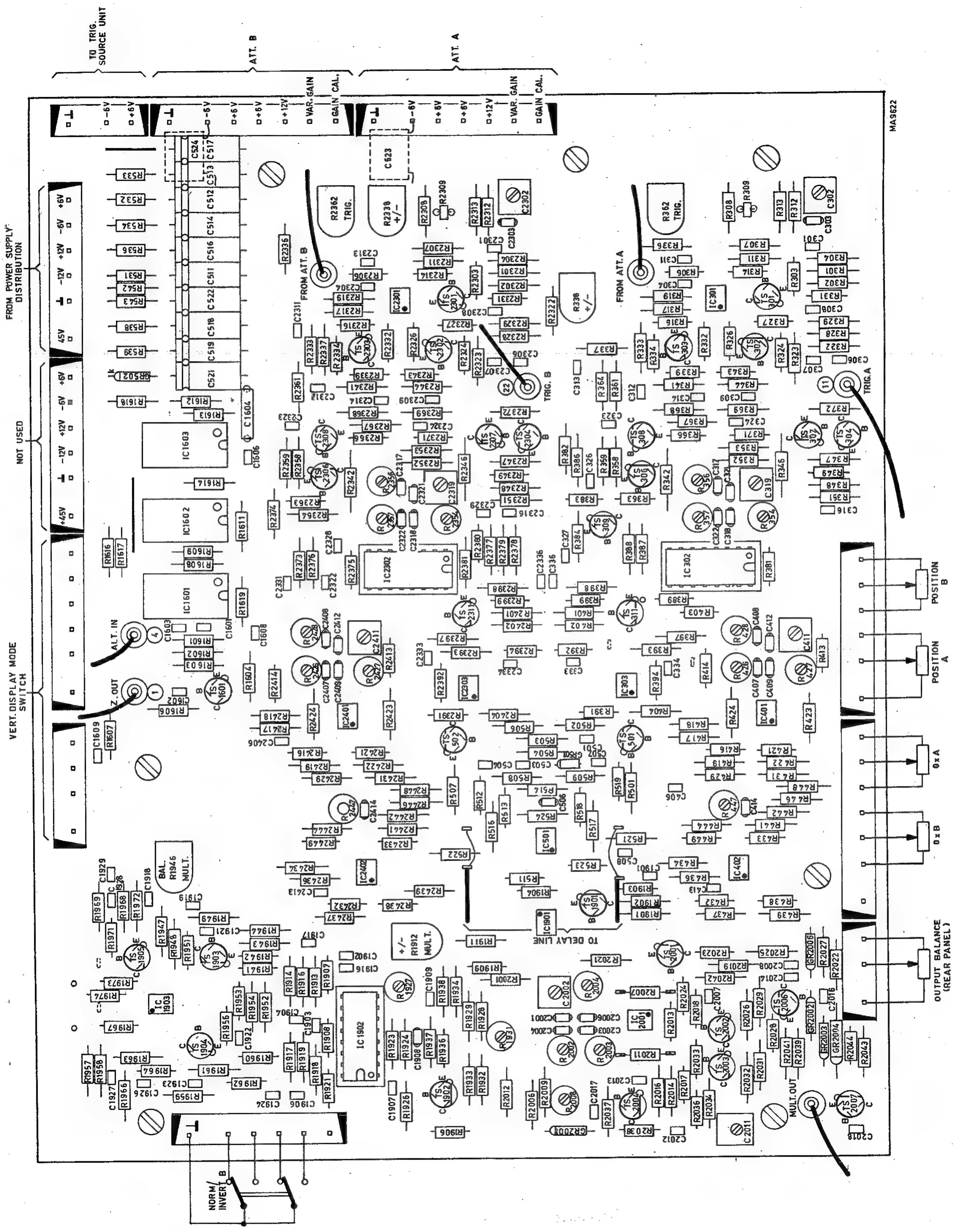


Fig. 3.21. Component lay-out intermediate amplifier with multiplier

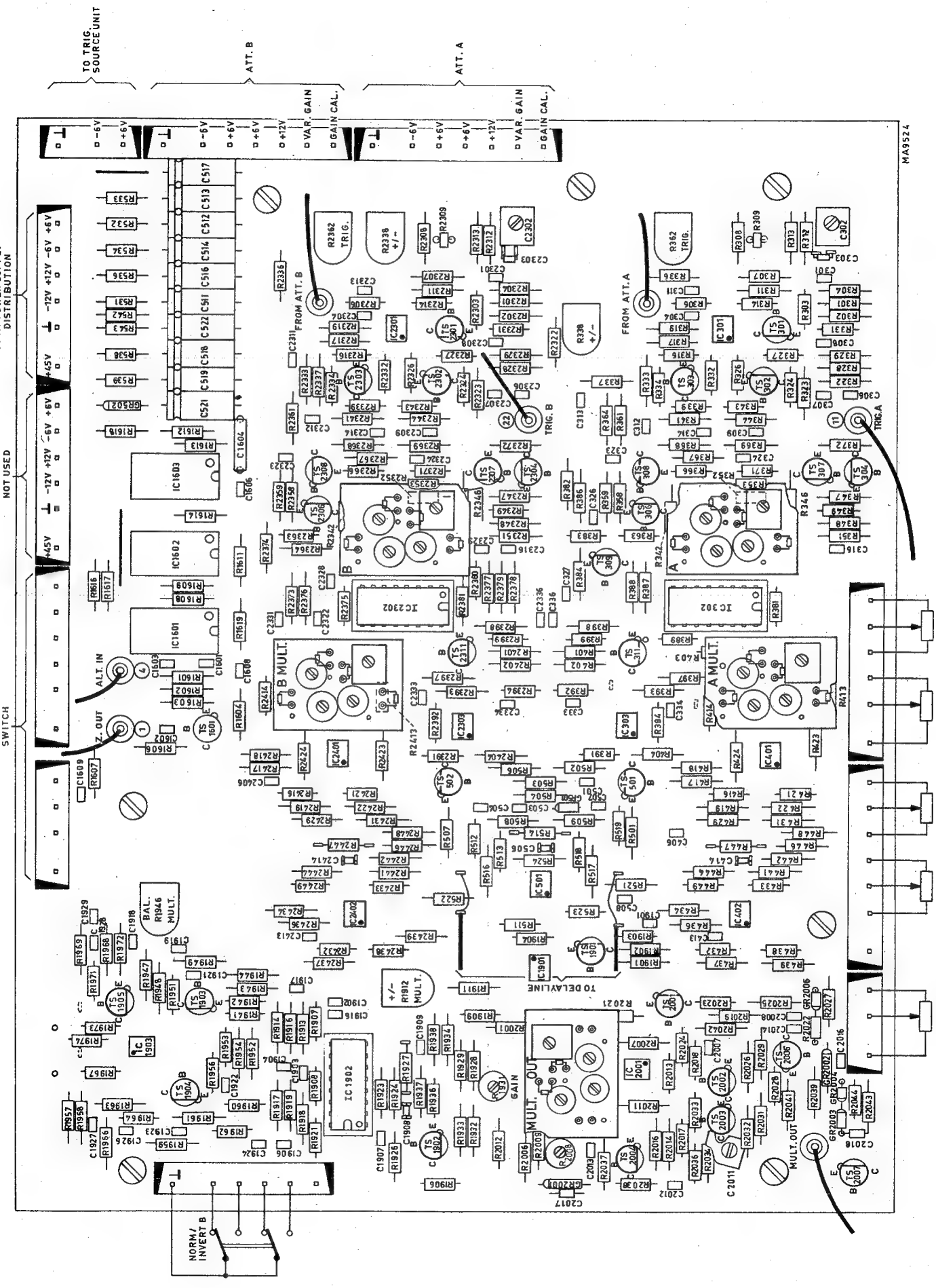


Fig. 3.22. As Fig. 3.21. but with incorporated H.F. compensation circuits

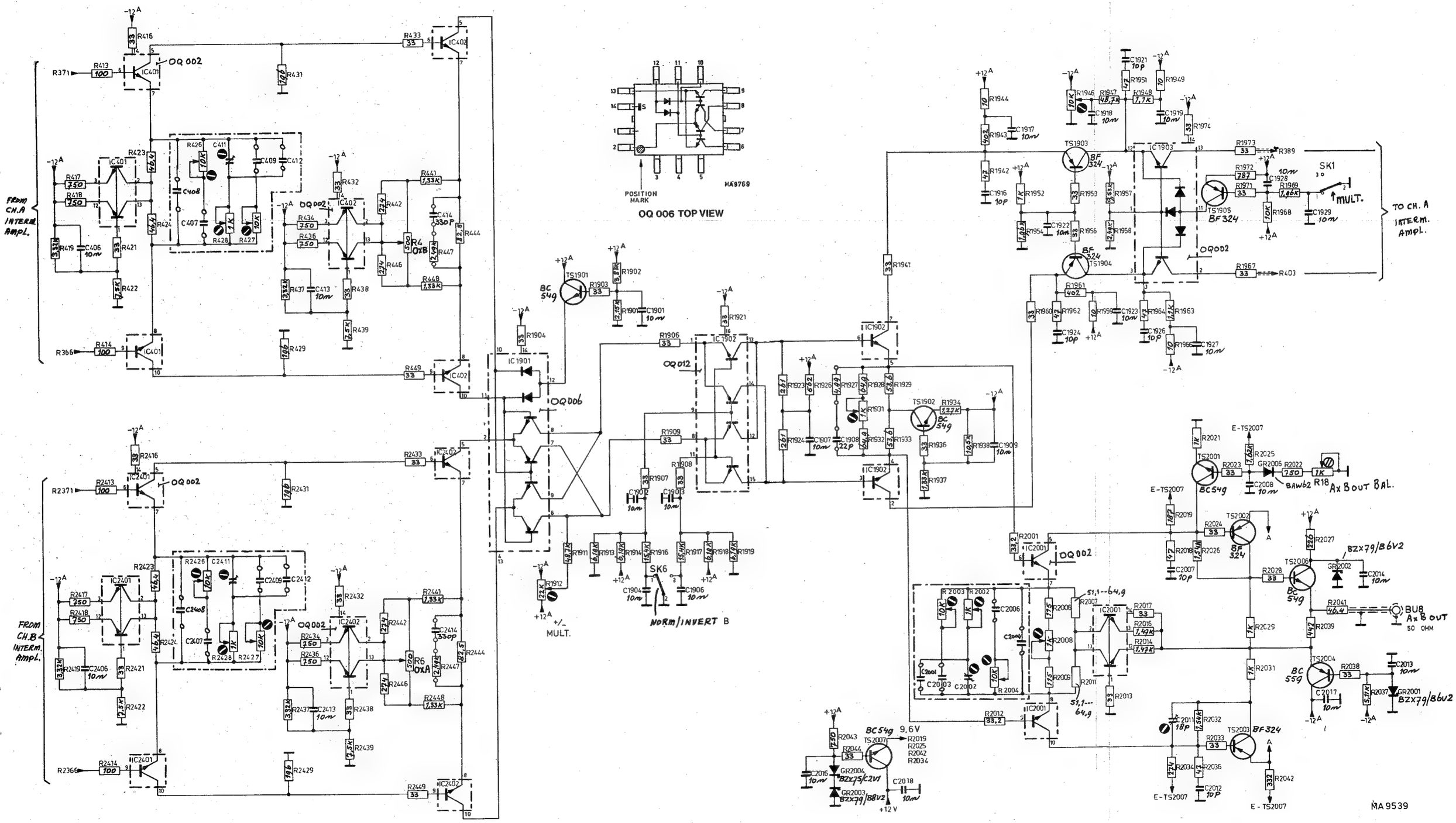


Fig. 3.23. Circuit diagram multiplier

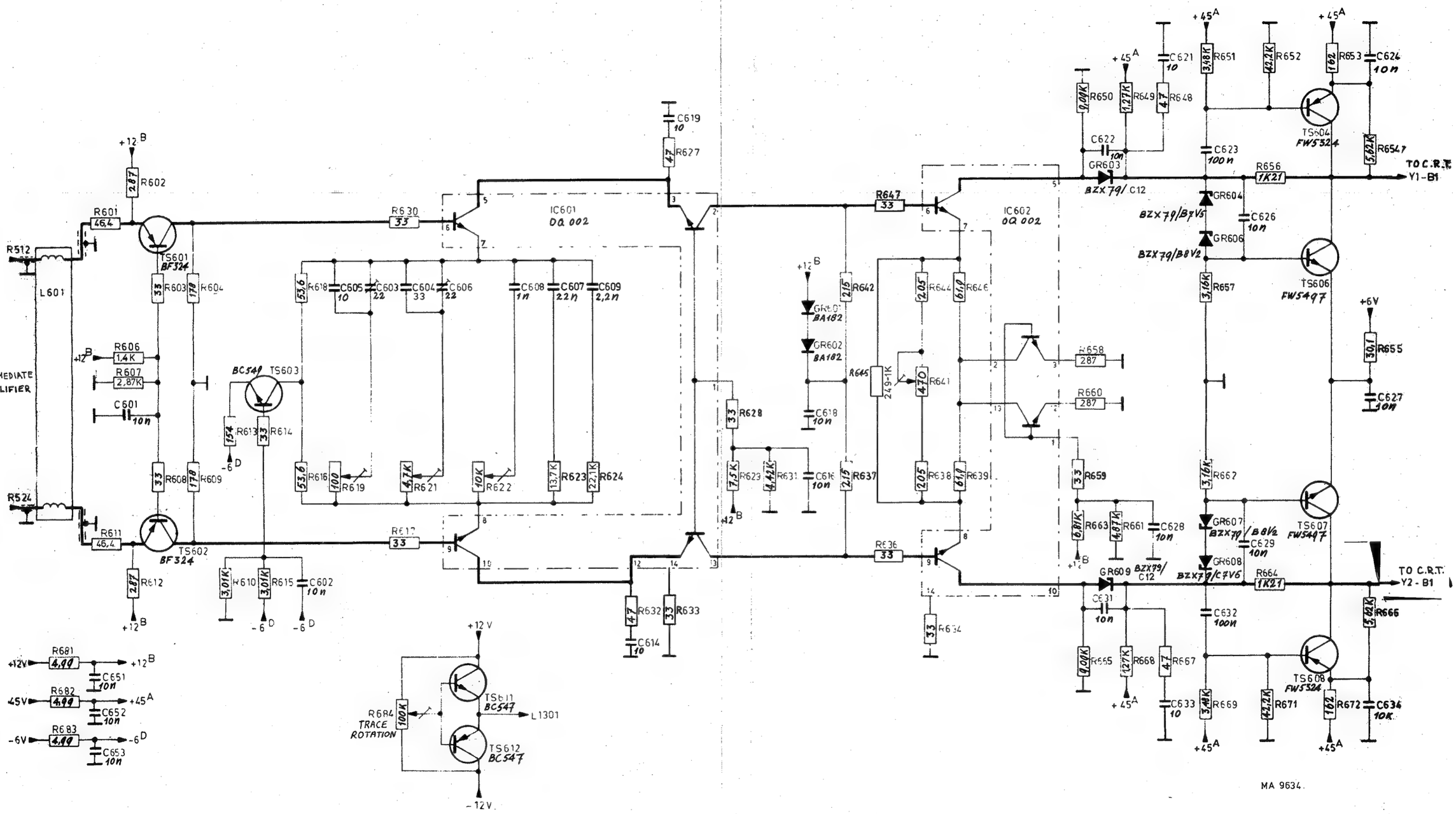


Fig. 3.24. Circuit diagram final Y amplifier

X defl. signal to time base unit (TS1071)

EXT. MTB. BU6

FROM POWER SUPPLY C1822

FROM PRE-AMPLIFIER CHANNEL B R448

SK21 SK19 SK20 SK18

DC LF HF EXT MAINS MTB

SK5 SK4 SLOPE

TO M.T.B. C856

TO DEL'D T.B C1056

LEVEL R10 LEVEL R8

DTB SWEEP GATING MULTI. VIBR. R1071

FROM PRE-AMPLIFIER CHANNEL A R348

R532 R541

MA 9635

Fig. 3.25. Circuit diagram trigger source unit

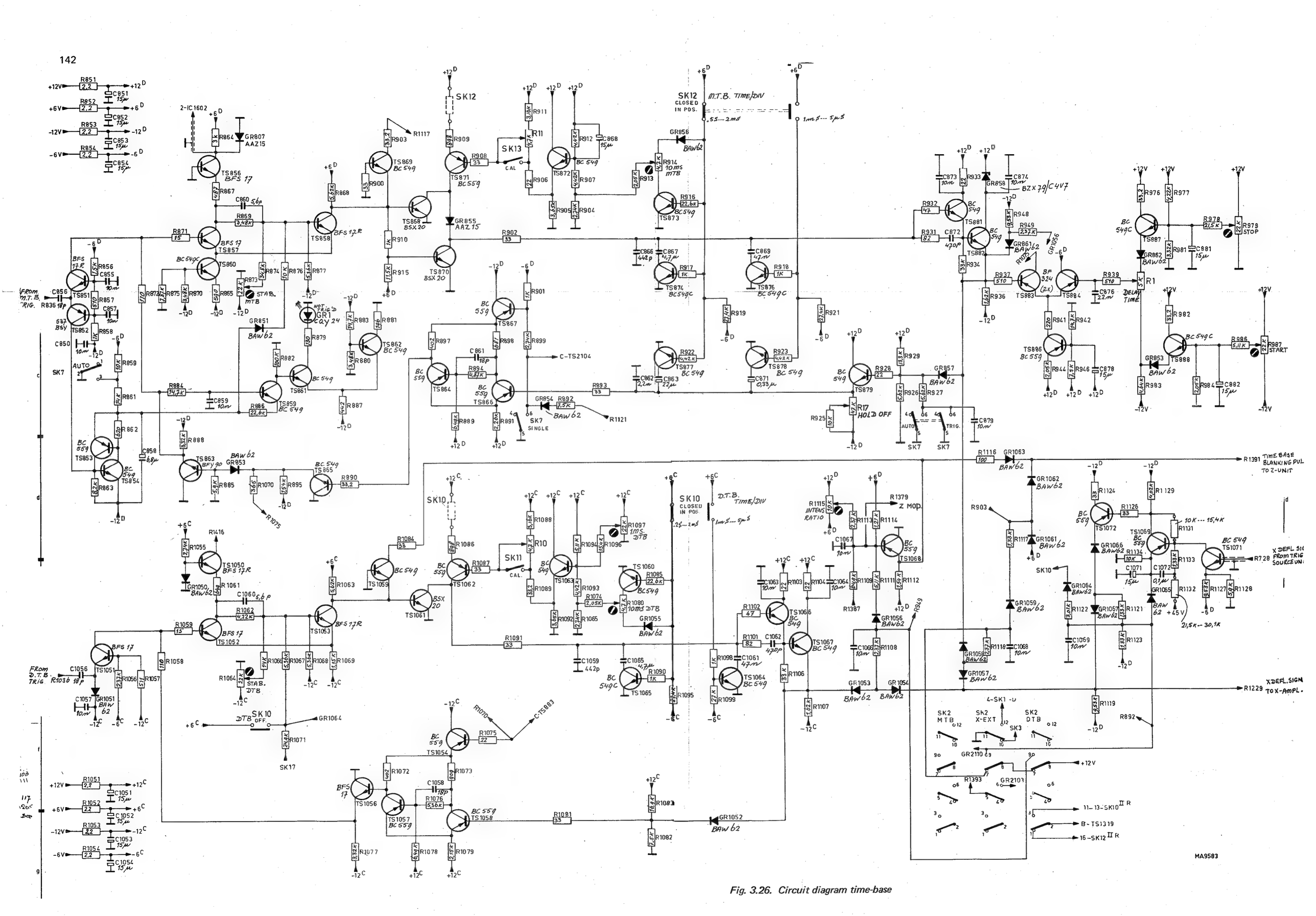


Fig. 3.26. Circuit diagram time-base

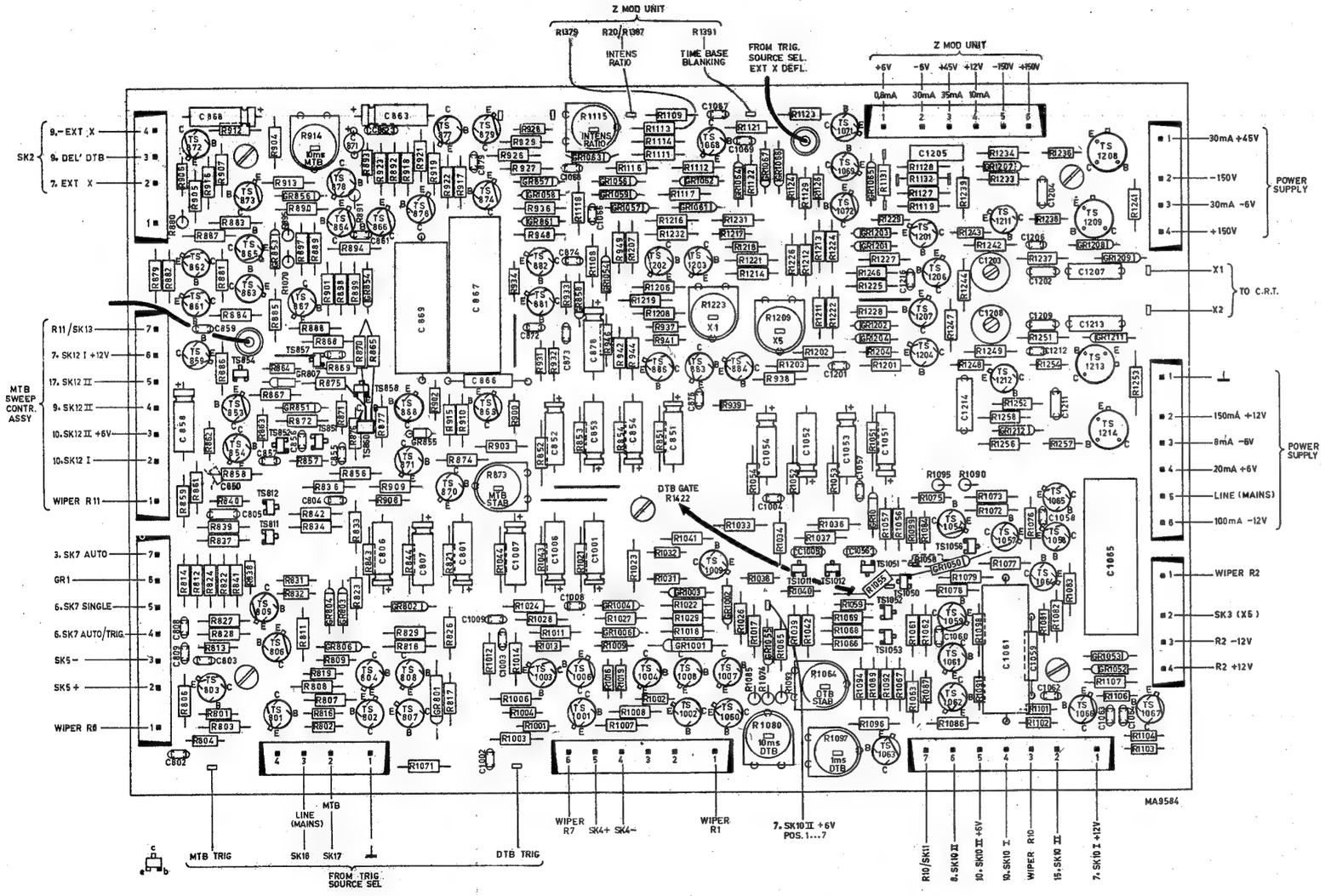


Fig. 3.27. Component lay-out time-base and X-amplifier

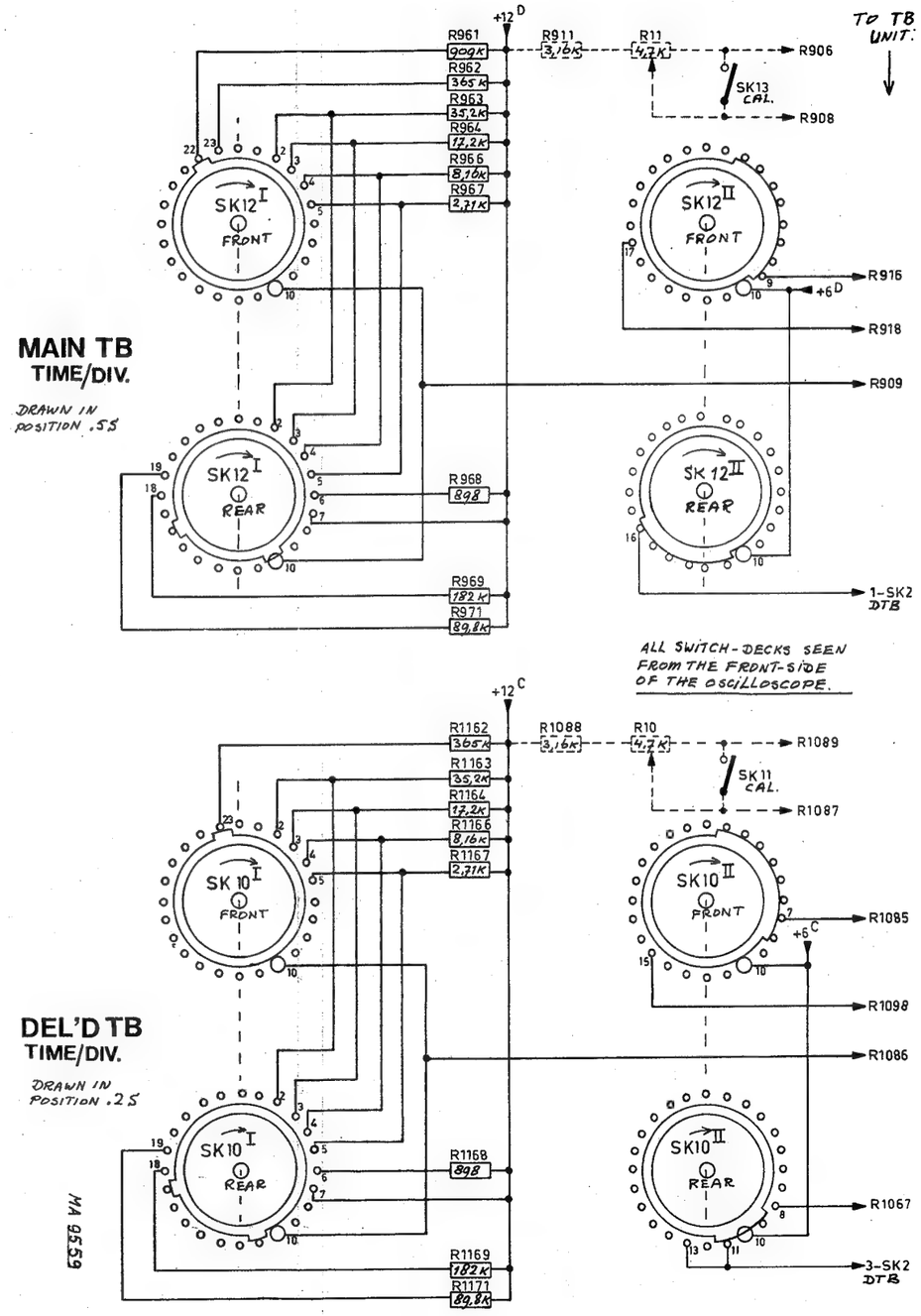


Fig. 3.28. Circuit diagram Main- and Delayed time-base sweep switches

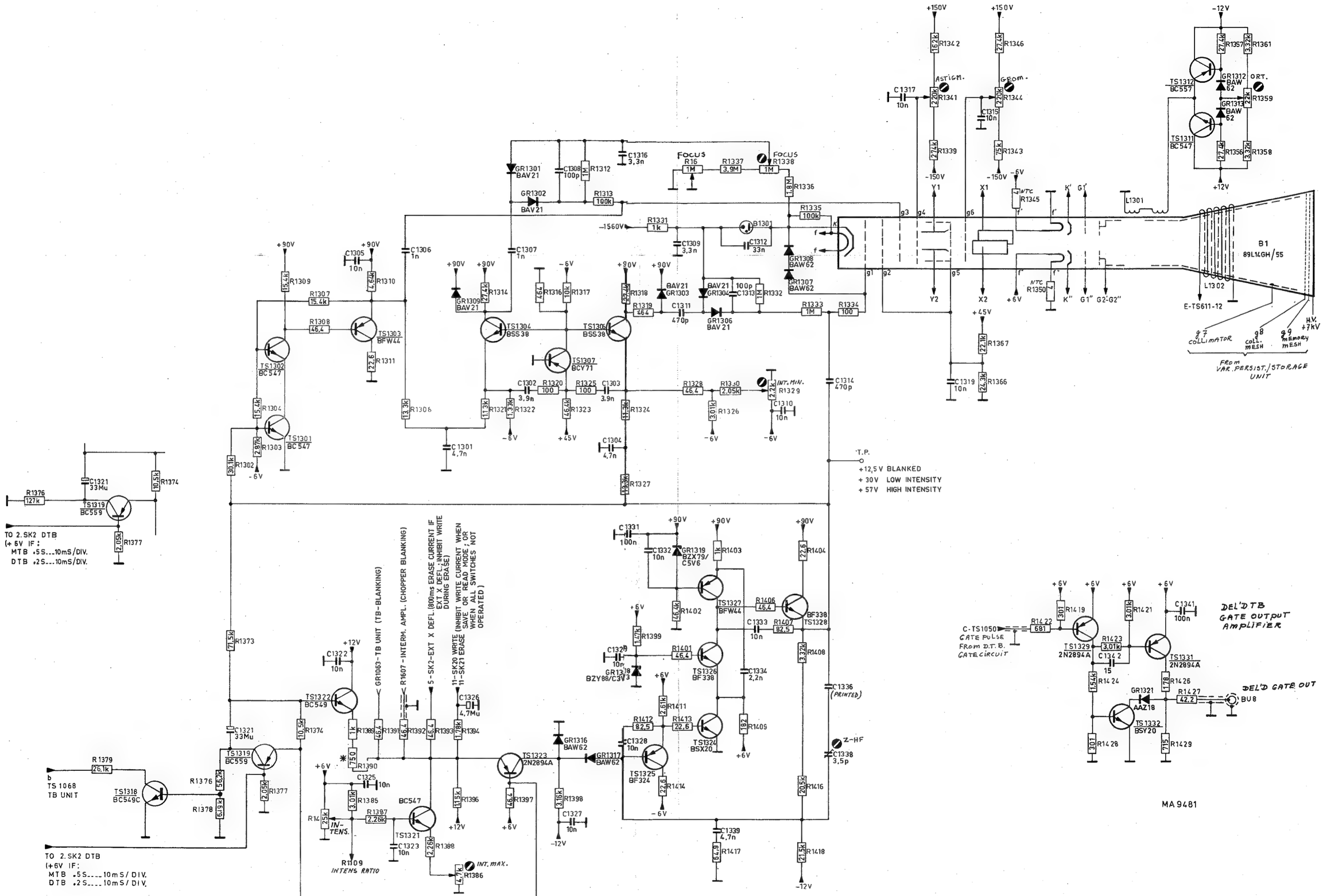


Fig. 3.29. Circuit diagram blanking amplifier and c.r.t.

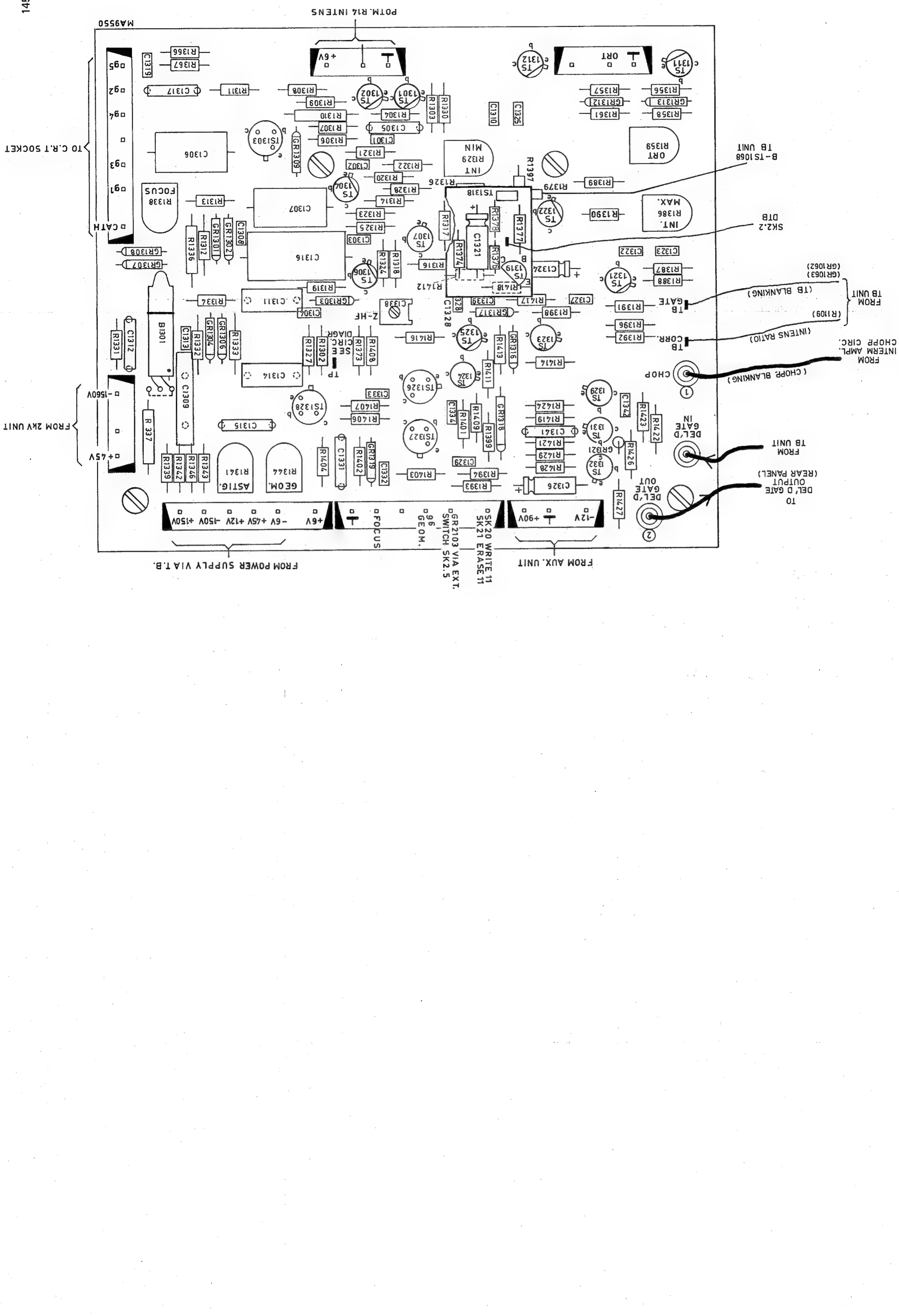


Fig. 3.30. Component lay-out blanking amplifier

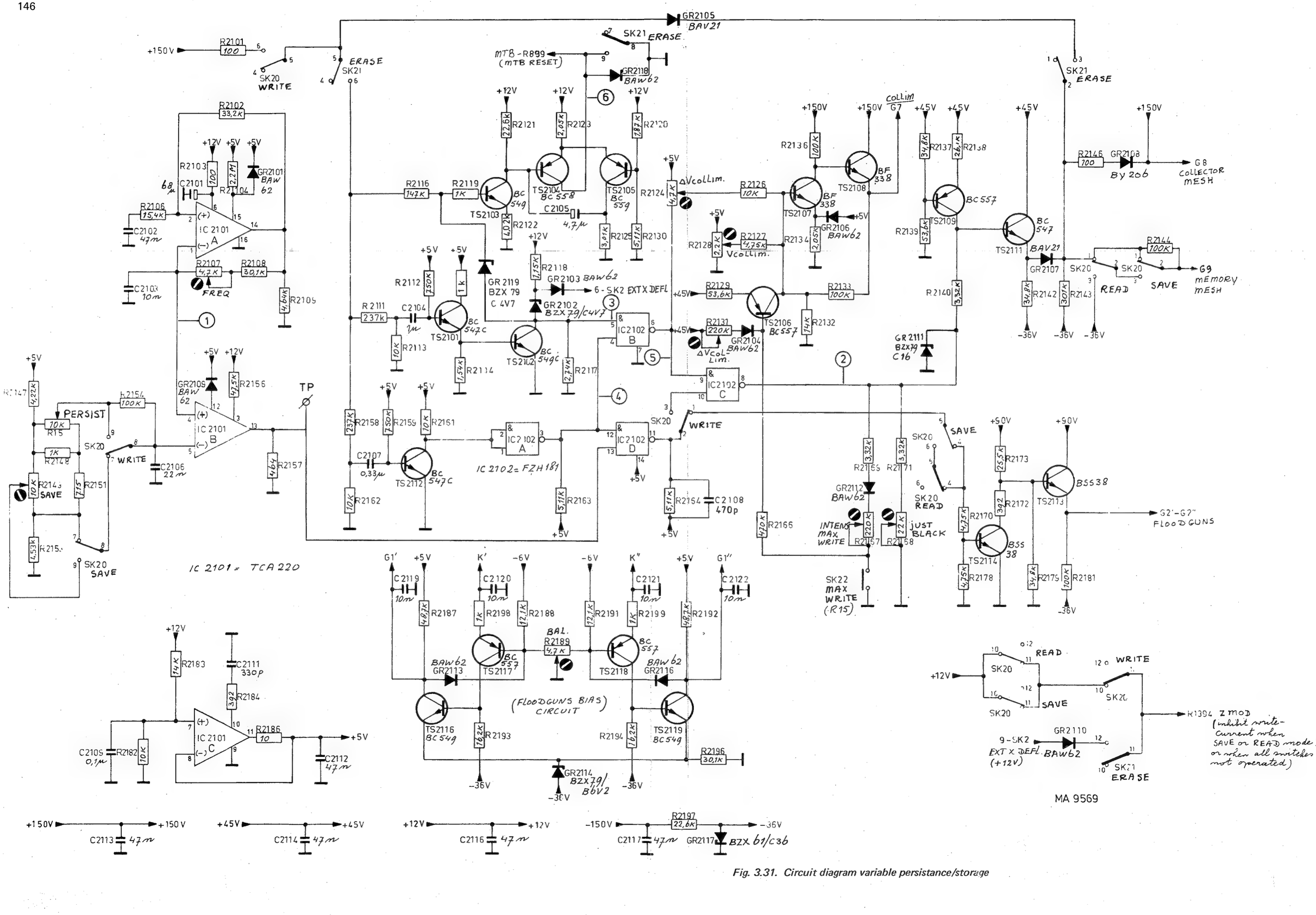


Fig. 3.31. Circuit diagram variable persistance/storage

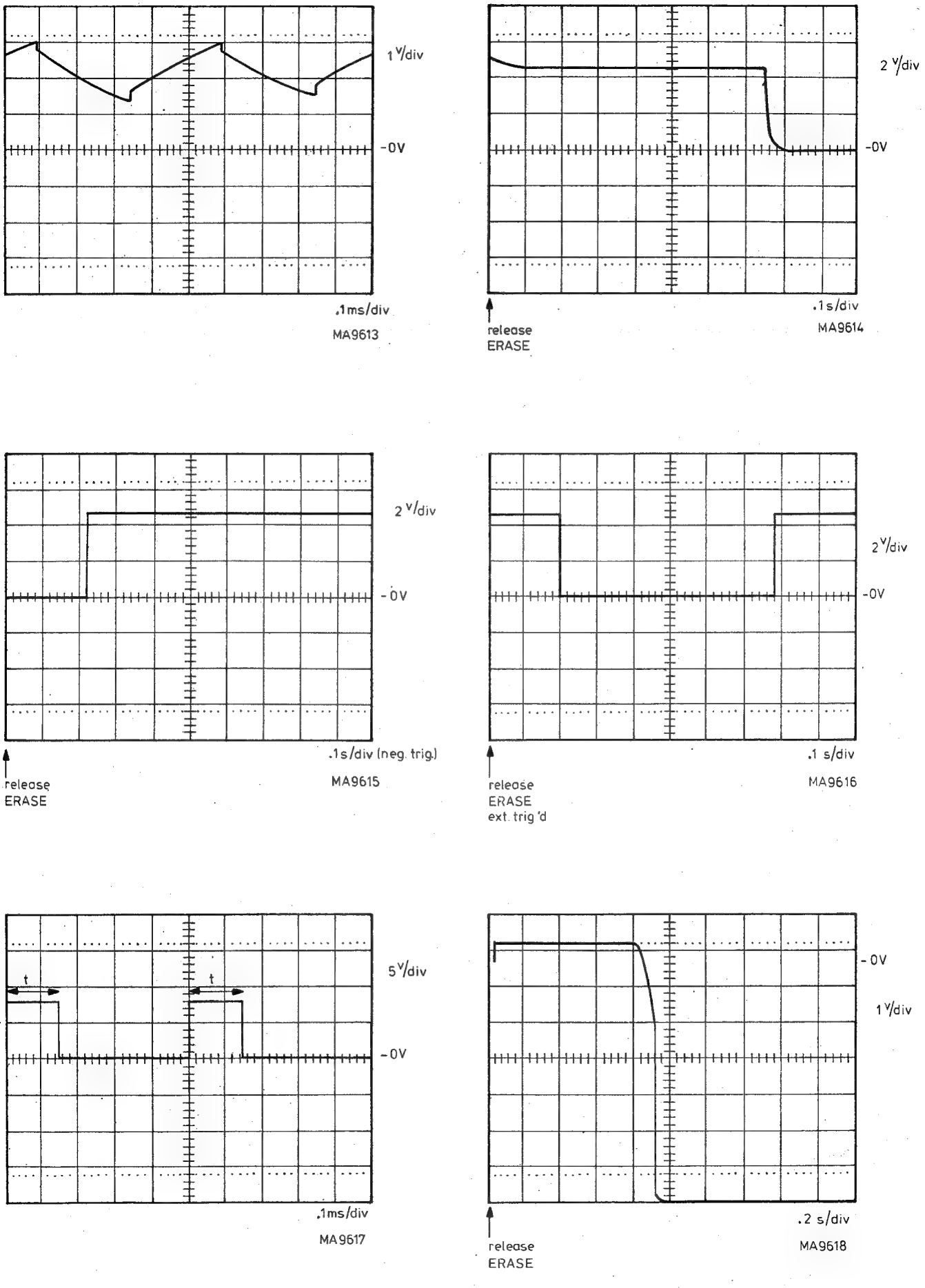


Fig. 3.32. Some wave-forms in the variable persistence/storage circuit

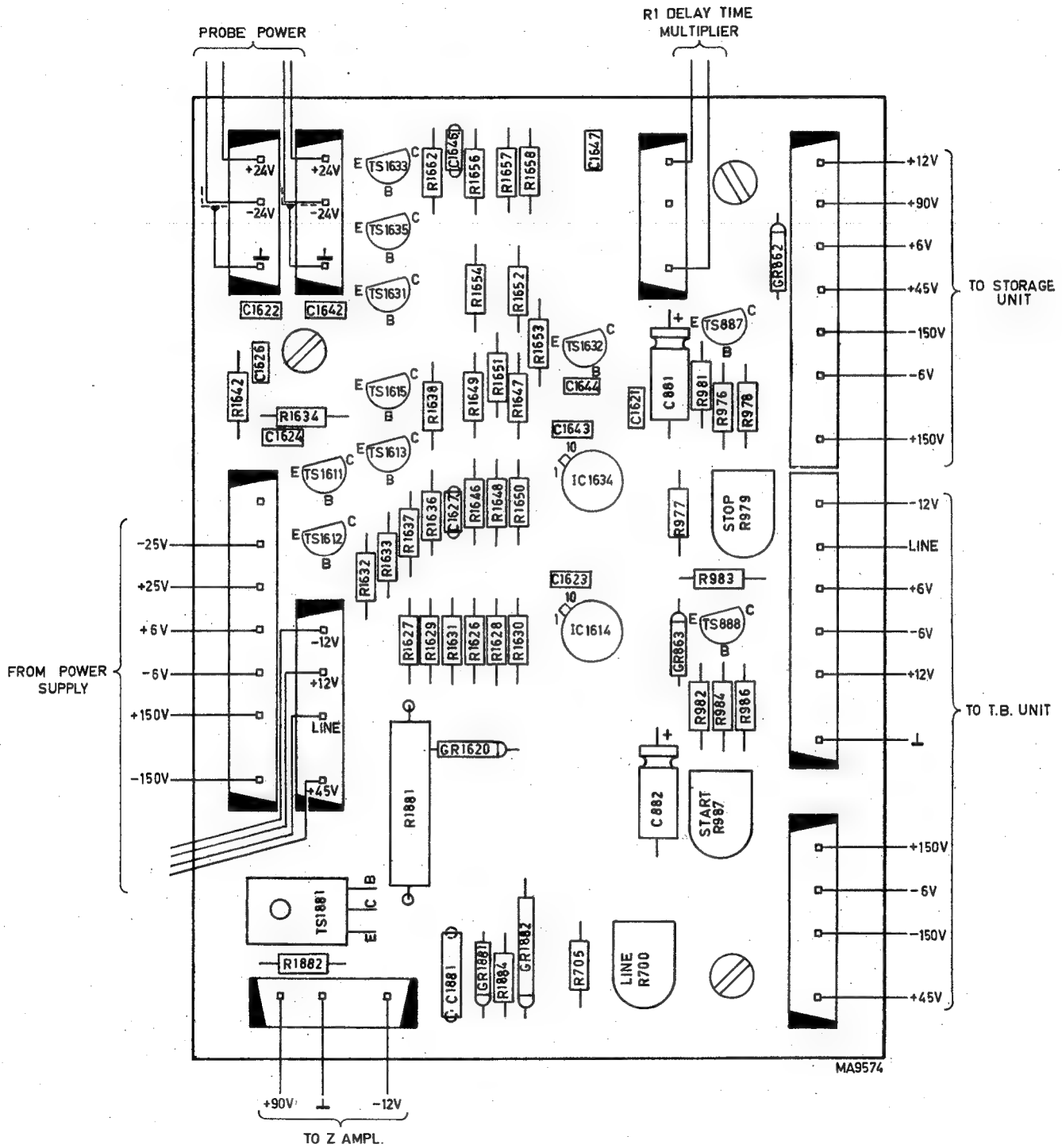


Fig. 3.33. Component lay-out variable persistence/storage

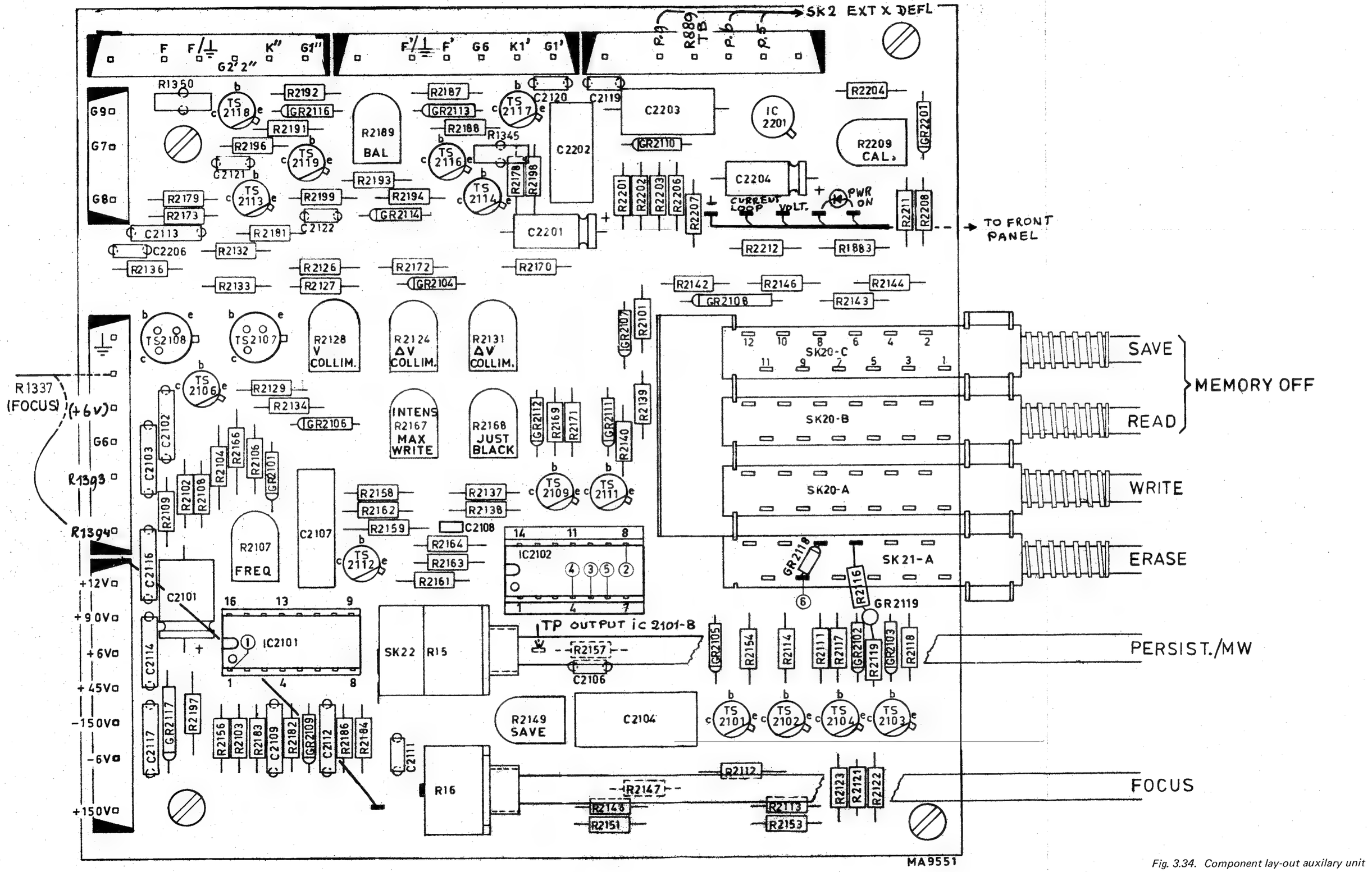


Fig. 3.34. Component lay-out auxilary unit

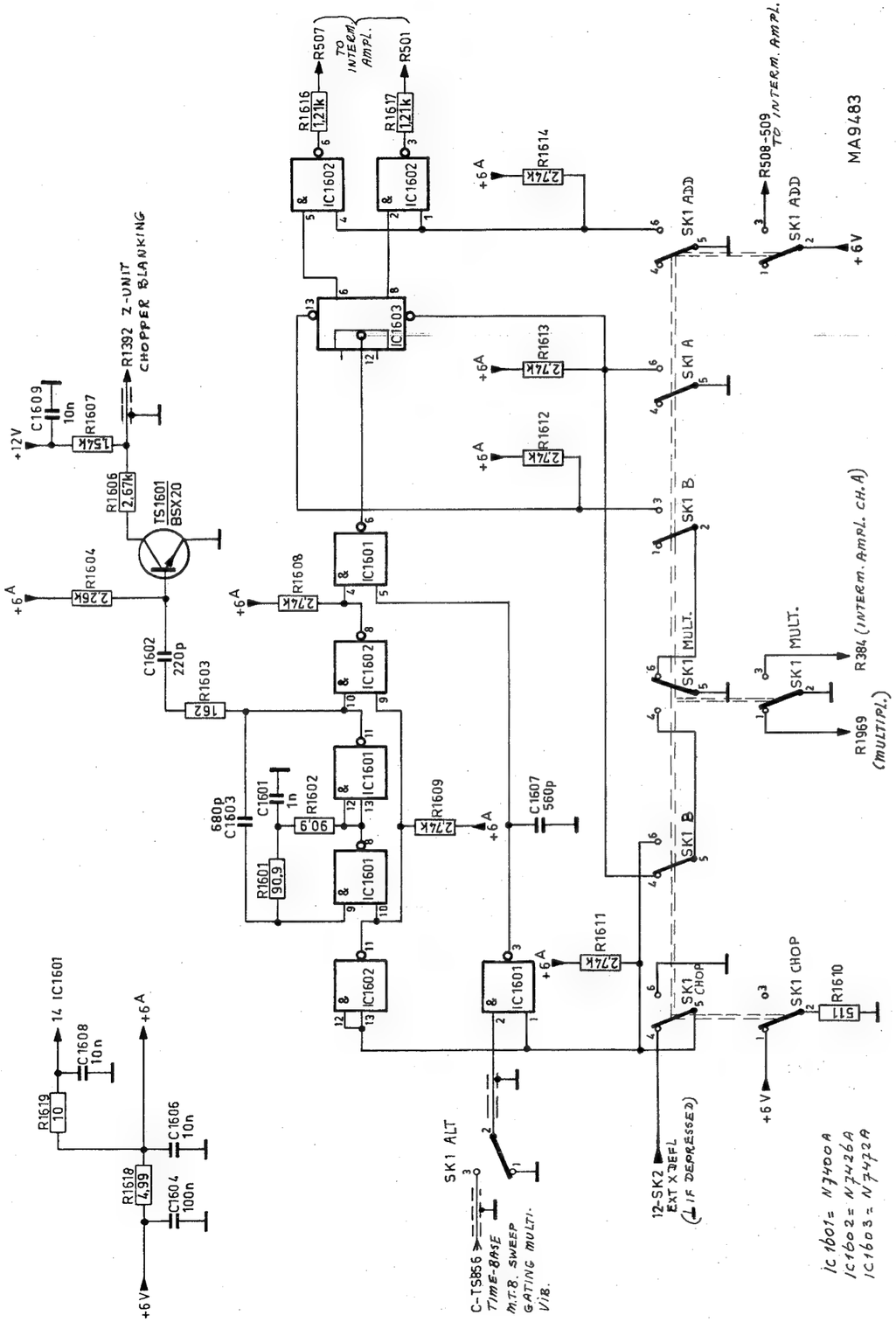


Fig. 3.35. Circuit diagram channel selection logic

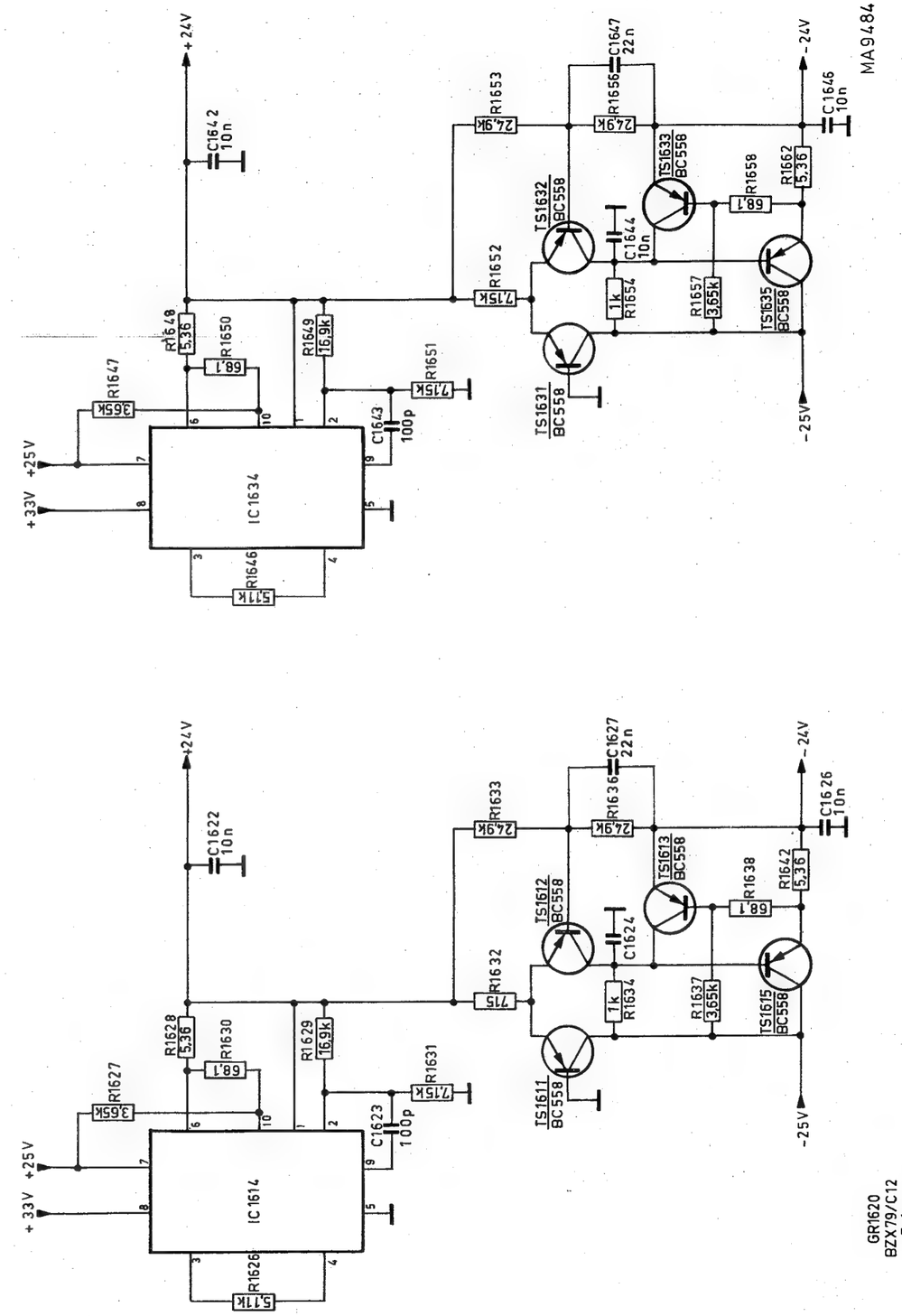


Fig. 3.36. Circuit diagram probe power

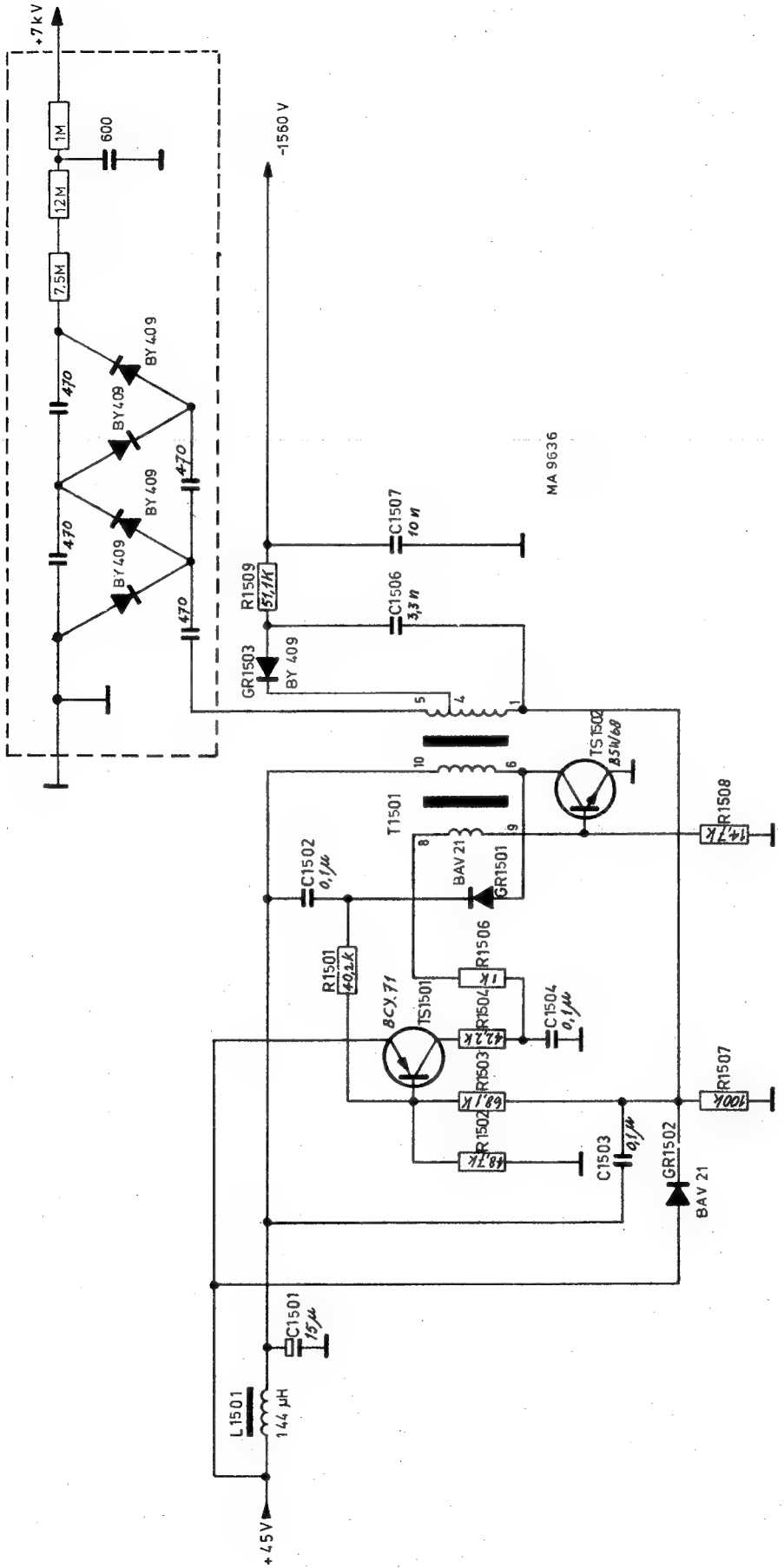


Fig. 3.37. Circuit diagram 2 kV unit with h.t. rectifier

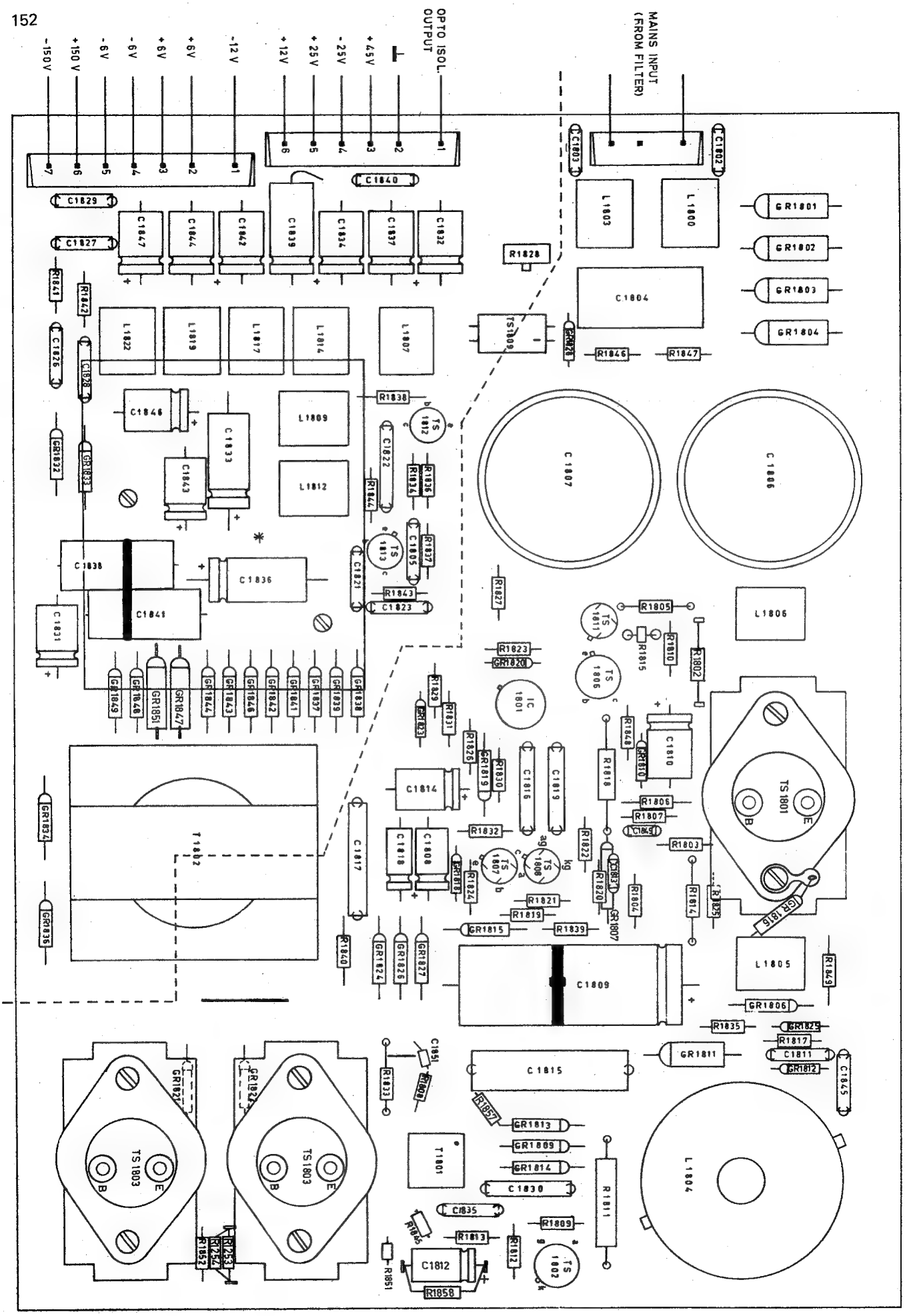


Fig. 3.38. Circuit diagram power supply unit

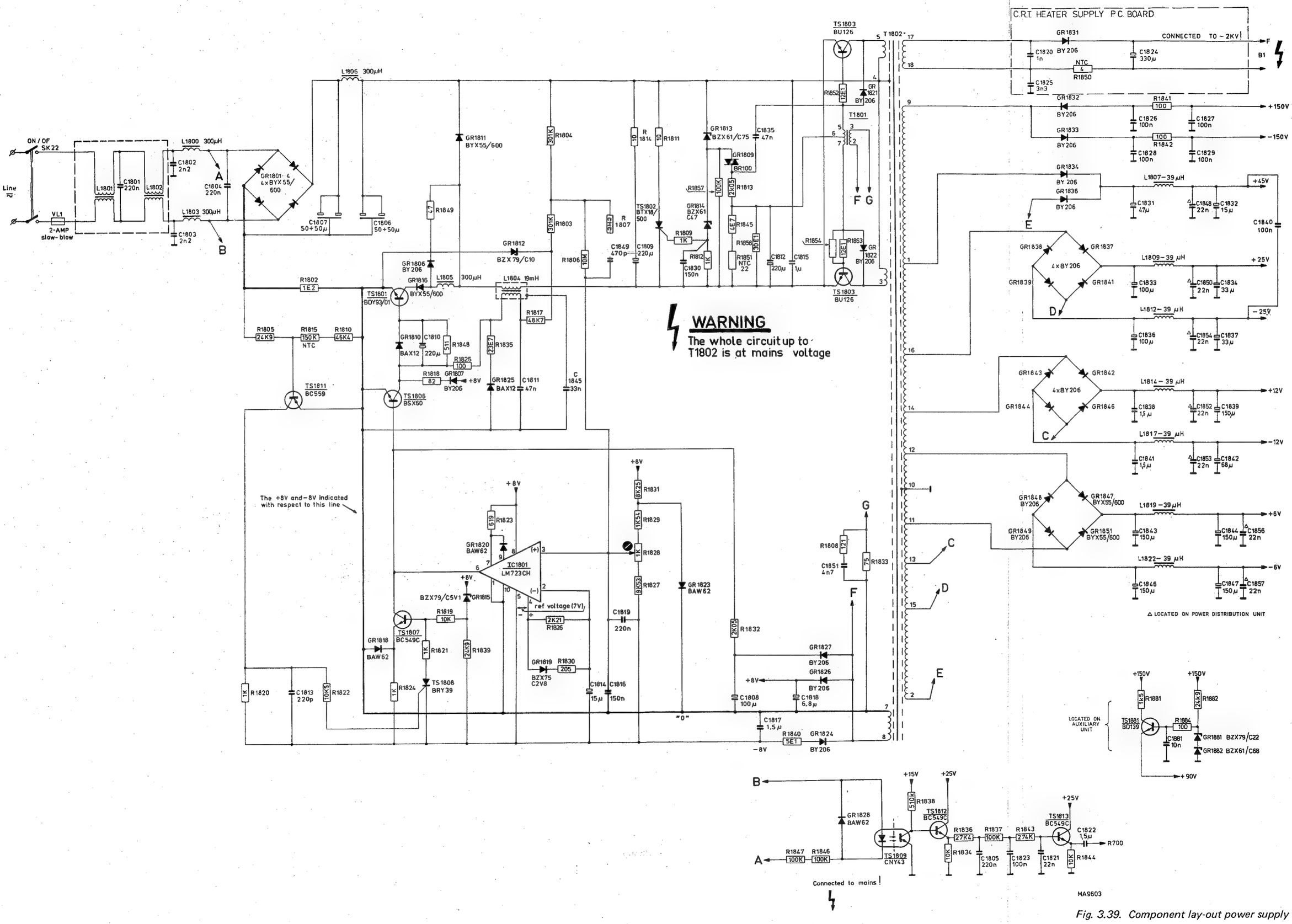
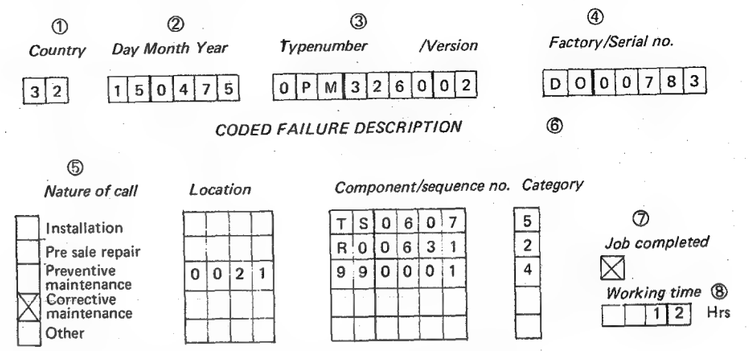


Fig. 3.39. Component lay-out power supply unit

CODING SYSTEM OF FAILURE REPORTING FOR QUALITY ASSESSMENT OF T & M INSTRUMENTS
(excl. potentiometric recorders)

The information contents of the coded failure description is necessary for our computerized processing of quality data.

Since the reporting of repair and maintenance routines must be complete and exact, we give you an example of a correctly filled-out PHILIPS SERVICE Job sheet.



Detailed description of the information to be entered in the various boxes:

①Country: 3 2 = Switzerland

②Day Month Year 1 5 0 4 7 5 = 15 April 1975

③Type number/Version O P M 3 2 6 0 0 2 = Oscilloscope PM 3260, version 02 (in later oscilloscopes this number is placed in front of the serial no)

④Factory/Serial number D O 0 0 7 8 3 = DO 783 These data are mentioned on the type plate of the instrument

⑤ Nature of call: Enter a cross in the relevant box

⑥ Coded failure description

Location

These four boxes are used to isolate the problem area. Write the code of the part in which the fault occurs, e.g. unit no or mechanical item no of this part (refer to 'PARTS LISTS' in the manual).

Example: 0001 for Unit 1
000A for Unit A
0075 for item 75

If units are not numbered, do not fill in the four boxes; see Example Job sheet.

Component/sequence no.

These six boxes are intended to pinpoint the faulty component.

A. Enter the component designation as used in the circuit diagram. If the designation is alfa-numeric, the letters must be written (starting from the left) in the two left-hand boxes and the figures must be written (in such a way that the last digit occupies the right-most box) in the four right-hand boxes.

B. Parts not identified in the circuit diagram:

990000 Unknown/Not applicable
990001 Cabinet or rack (text plate, emblem, grip, rail, graticule, etc.)
990002 Knob (incl. dial knob, cap, etc.)
990003 Probe (only if attached to instrument)
990004 Leads and associated plugs
990005 Holder (valve, transistor, fuse, board, etc.)
990006 Complete unit (p.w. board, h.t. unit, etc.)
990007 Accessory (only those without type number)
990008 Documentation (manual, supplement, etc.)
990009 Foreign object
990099 Miscellaneous

Category

0 Unknown, not applicable (fault not present, intermittent or disappeared)
1 Software error
2 Readjustment
3 Electrical repair (wiring, solder joint, etc.)
4 Mechanical repair (polishing, filing, remachining, etc.)
5 Replacement (of transistor, resistor, etc.)
6 Cleaning and/or lubrication
7 Operator error
8 Missing items (on pre-sale test)
9 Environmental requirements are not met

⑦ Job completed: Enter a cross when the job has been completed.

⑧ Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

1 2 = 1,2 working hours (1 h 12 min.)

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equipment for science and industry

1977-03-28 | TEST AND MEASURING EQUIPMENT | OSC 6

MULTIPLIER-STORAGE OSCILLOSCOPE

PM 3243

Re.: a. Suppression of ripple and jitter
b. Time-base sweep time accuracy

a. In order to suppress ripple on the trace, spurious intensity modulation and delayed time-base jitter, the filtering of some supply voltages has been improved.
Four electrolytic capacitors have been added:
– Between +6 V and earth, and between –6 V and earth, each a 330 muF 10 V capacitor.
– Between +12 V and earth, and between –12 V and earth, each a 150 muF 16 V capacitor
These capacitors have been mounted on the power distribution p.c. board located at the inner side of the rear panel of the instrument.

Moreover the 9,53 ohms resistors R533, R536, R538 and R539 (+6 V attenuator filtering) located on the intermediate amplifier unit have been changed to 20,5 ohms each; refer to Fig. 1.

Above modification is present in instruments from serialnr D725 onwards.

b. In some instruments the sweep times (main- and delayed time-base) of 2 μs/DIV and shorter may be approx. 3 % too long.
In these instruments capacitors C866 and C1059 are probably 453 pF each.
Changing these capacitors to 442 pF improves the sweep time accuracy in above mentioned time-base range; refer to Fig. 2 and 3.

Codenumbers:

– Capacitors	
330 muF 10 V d.c.	4822 124 20465
150 muF 16 V d.c.	4822 124 20586
442 pF 1 %	4822 121 50549
– Resistors	
20,5 ohms MR25 1 %	5322 116 50678

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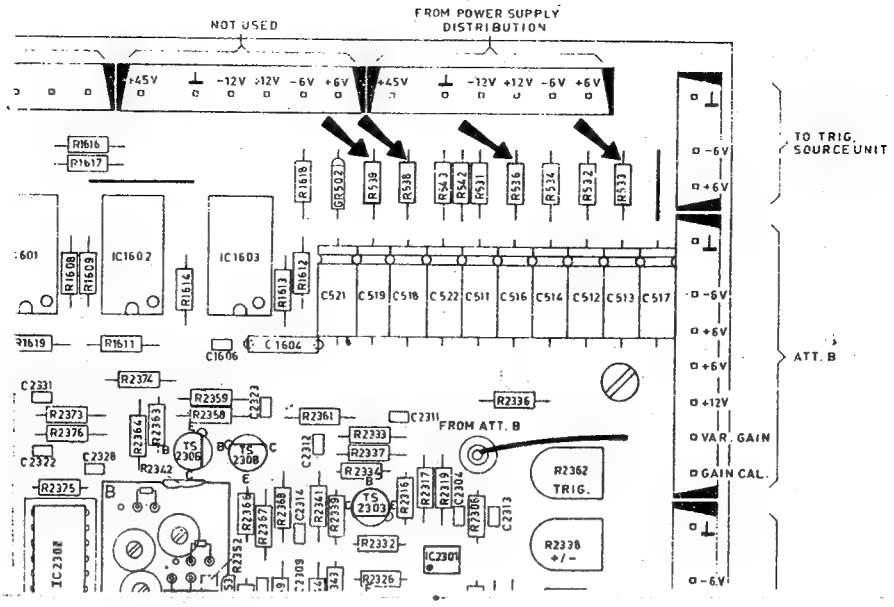

Fig. 1. R533, R536, R538 and R539 on intermediate amplifier unit

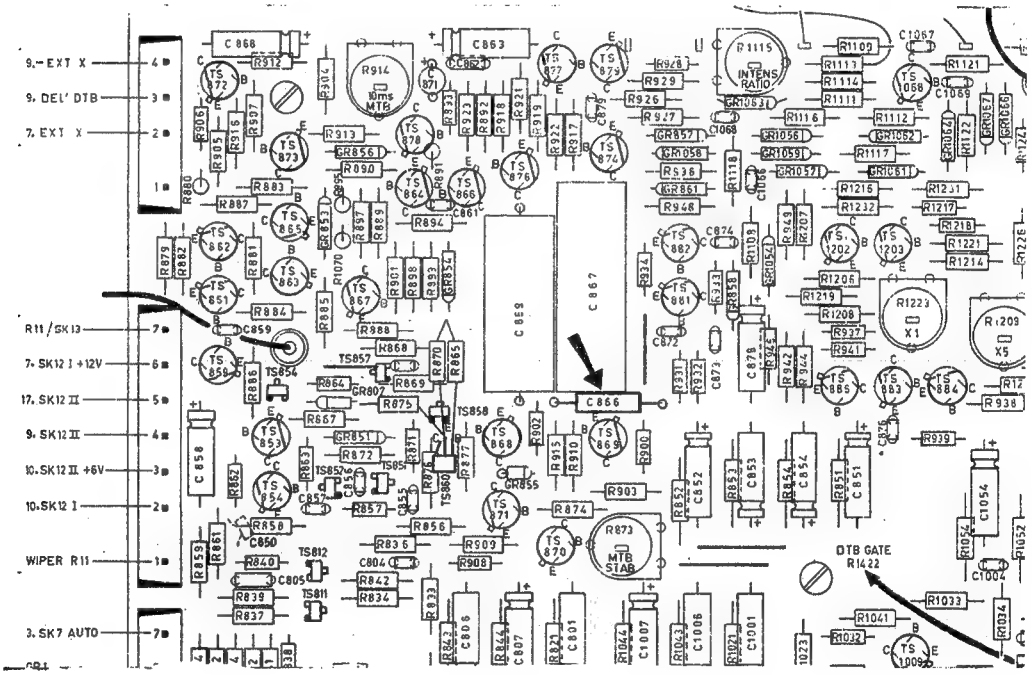

Fig. 2. C866 (MTB) on time-base unit

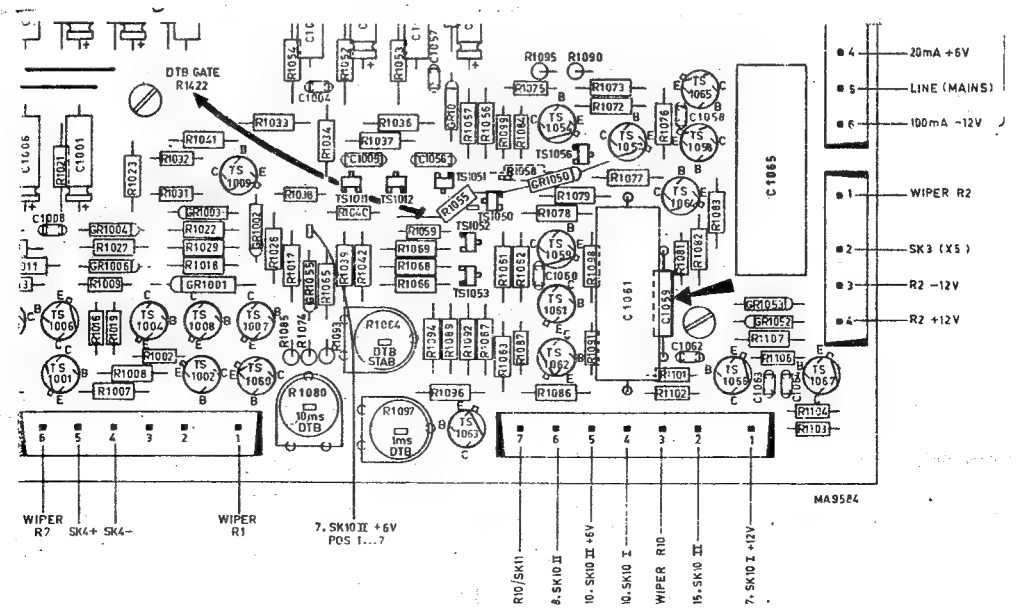

Fig. 3. C1059 (DTB) on time-base unit

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OSCILLOSCOPES

SUBJECT: Upper and lower cabinet plates (complete)
(new service ordering codes)

PM 3240 – PM 3244 – PM 3260 – PM 3261 – PM 3265
(without holes)

UPPER CABINET PLATE	5322 447 94147
LOWER CABINET PLATE	5322 447 94146

PM 3262
(with holes)

UPPER CABINET PLATE	5322 447 94574
LOWER CABINET PLATE	5322 447 94575

PM 3243
(without holes)

UPPER CABINET PLATE	5322 447 94602
LOWER CABINET PLATE	5322 447 94603

PM 3263 – PM 3266
(with holes)

UPPER CABINET PLATE	5322 447 94482
LOWER CABINET PLATE	5322 447 94483

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equipment for science and industry

Concerns: The 50 MHz Storage, Multiplier Oscilloscope PM3243.

Already published: OSC 38 for manual 9499 440 17102
OSC 57 for manual 9499 440 20302

Subject: Modifications to change the memory-off voltage from –36V to –48V.

This service information sheet will be packed together with a c.r.t. for the PM 3243, which needs a –48V memory-off voltage on the memory mesh G9.
In older instruments (up to PM 3243/05) this memory-off voltage is –36V.
See manual 9499 440 17102, fig. 3.31, SK20 point 3 (READ).
Starting with the PM 3243/05 this memory-off voltage is changed in –48V.
See manual 9499 443 00902, fig. 3.45, SK20 point 3 (READ).
To adapt an older instrument to a new c.r.t., which needs a memory-off voltage of –48V, the following modifications must be made:

1. Remove the variable persistence and storage unit as indicated in manual 9499 443 00902, section 3.4.6.
2. Interrupt the track (on the track-side of the p.w.b.) between point 3 of SK20B (READ) and the anode of GR2117 as indicated in fig. 1 (A)
3. Remove resistor R2197 (22k6)
4. Solder one side of a resistor of 20k5 (5322 116 55255) on the point, which is connected with C2117 as indicated in fig. 1 (B) (on the component side of the p.w.b.)
5. Solder between the resistor of 20k5 and the anode of the zenerdiode GR2117 a zenerdiode (GR2115) BZX 79 C12 (4822 130 34197). The cathode of GR2115 to the anode of GR2117 (see fig. 1)
6. Mount an interconnection wire between the anode of GR2115 (fig. 1 (C)) and point 3 of the switch SK20B (READ)
7. Mount the unit in the instrument.

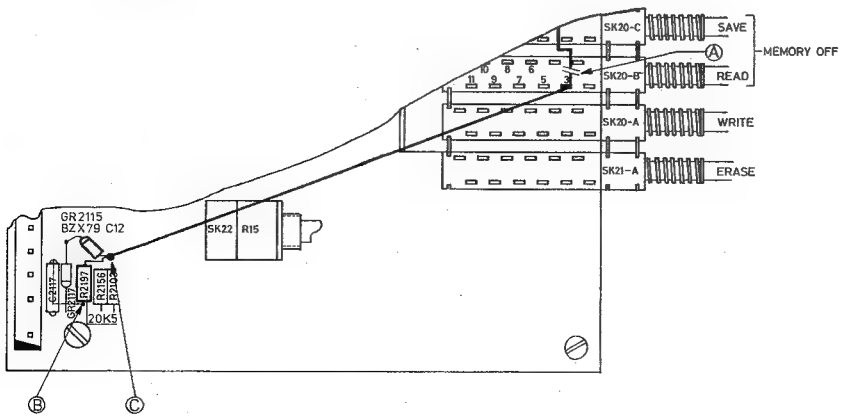

Fig. 1. Part of variable persistence and storage unit.

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810126 TEST AND MEASURING EQUIPMENT OSC 89

OSCILLOSCOPE PM 3243

Already published:
- OSC 6, OSC 10, OSC 38 belonging to manual 9499 440 17102 for the PM 3243 up to version 08.
- manual 9499 443 00902 for the PM 3243/08

Subject: Modifications to manual 9499 443 00902 for the PM 3243/08 and following versions.

Contents:

1. Z-amplifier (unit 11 - B 1301).
2. 2kV converter (unit 6 - R 1508).
3. Memory - off voltage (unit 7).
4. Final Y - amplifier (unit 13 - TS 604, TS 608).
5. Power supply (unit 5 - R 1826).
6. Variable persistence/storage (unit 7 - GR 2111).
7. Earthing of the rear cabinet plate.
8. Removing the carrying handle.

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1. Z-amplifier (unit 11).

The neon-tube B 1301 (ZA 1004) is no longer available.
This neon-tube can only be replaced by a temperature independent circuit (see fig. 1), to get a stabilised voltage drop between the cathode and g1 of the c.r.t.

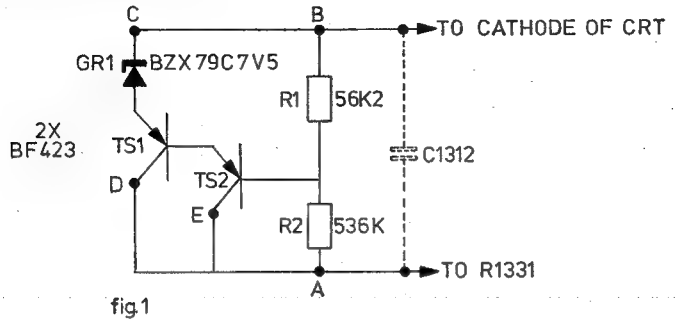

fig.1

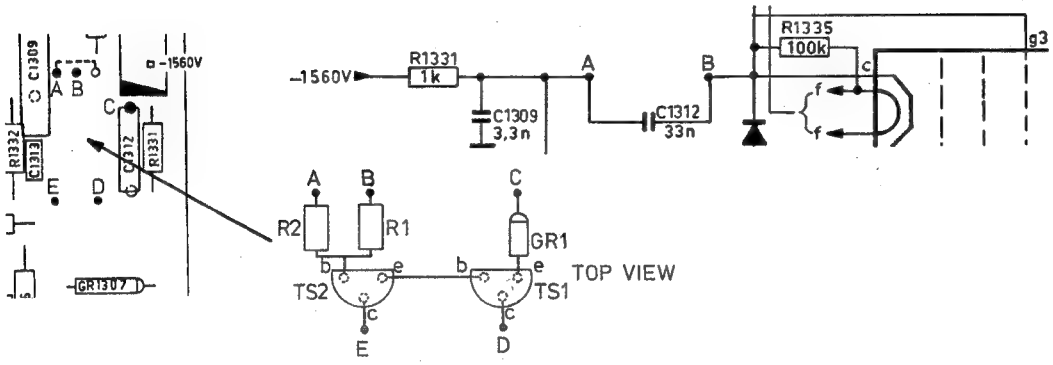

Fig. 2. Part of Z-unit (fig. 3.42 and 3.43 of the manual).

Parts list:

TS1	BF 423	4822 130 41543
TS2	BF 423	4822 130 41543
GR1	BZX 79C 7V5	4822 130 30861
R1	56K2	4822 116 51264
R2	536K	5322 116 54758

If the neon-tube must be replaced, proceed as follows:

- Solder the parts together as indicated in fig. 2.
- Solder the collectors of the two transistors on points E and D of the Z-amplifier.
- Solder the resistors R1 and R2 and the diode GR1 on the points A, B and C of the Z-amplifier (see fig. 2.).
- Readjust the Minimum Intensity (R 1329) as described in section 3.8.6.3 of the manual.
- Check the Intensity Ratio (R 1115) as described in section 3.8.6.5 of the manual.
- Readjust the Just Black Level (R 2168) and check the Intensity Max. Write as described in section 3.8.5.2

2. 2kV converter (unit 6).

To improve the performance of this unit resistor R 1508 is changed to 24k9, ordering number 5322 116 54648

3. Memory-off voltage (unit 7).

Starting with the PM 3243/05 the memory-off voltage is changed from -36V to -48V (memory-mesh G9).
Together with a new c.r.t., which needs a memory-off voltage of-48V, service information sheet OSC 73 is packet.
This OSC 73 describes the modifications which must be made to change the memory-off voltage from -36V to -48V.

4. Final Y amplifier (unit 13).

The transistors TS 604 and TS 608 are changed to:

BFX 48 ordering number 5322 130 40208
This modification is introduced because the FW 5324 is no longer available.

5. Power supply (unit 5).

To prevent starting problems of the power supply at high mains voltages and at high temperatures resistor R 1826 is changed to 10k5, ordering number 5322 116 50731

6. Variable persistence/storage unit (unit 7).

The zenerdiode GR 2111 is changed to BZX 79 C 16 ordering number 4822 130 34268
This modification is introduced to increase the maximum positive voltage level of the Just Black potentiometer R 2168 from + 13V to + 16V.
The amplitude of the erase-pulse (600 ms) can now be adjusted to maximum + 16V.
The specifications of the c.r.t. L 14 - 111 GH/55 indicate that some c.r.t.'s need an erase-pulse of + 15V.
So if the Just Black level can not be reached in older instruments replace GR 2111.

7. Earthing of the rear cabinet plate.

The earthing of the rear cabinet plate is improved for safety purposes.
The rear cabinet plate must be mounted with two screws, **toothed rings** and lock-washers on the cabinet.

8. Removing the carrying handle.

When the carrying handle can not be removed as described in the manual, proceed as follows:

1. Remove the upper and lower cabinet plates.
2. Remove the plastic strip which is snapped on to the grip.
3. Remove the four screws which secure the grip to the brackets (these screws have been locked with a sealing varnisch).
4. Depress the push-buttons in the brackets and turn the carrying handle **as far as possible to the upper side** of the oscilloscope.
5. Keep the push-button of the right-hand bracket depressed and pull the bracket from its bearing[1)]
6. Remove the grip from the remaining bracket.
7. Depress the push-button of the left-hand bracket and turn the latter **as far as possible to the lower side** of the instrument.
8. Keep the push-button depressed and pull the bracket from its bearing.

If it is impossible to remove the left-hand bracket in this way, remove also its bearing in a similar way as described in footnote 1).

1) With some instruments it may be impossible to remove the handle in the described way. This is due to an extra securing plate in the right-hand bearing. In that case, **DO NOT USE FORCE,** but work in accordance with the following procedure which replaces points 3, 4 and 5.

3. Remove the two screws which secure the grip to the right-hand bracket.
4. Remove the two hexagonal bolts which secure the right-hand bearing to the side strip.
5. Depress the push-button of the right-hand bracket and take the bearing from the bracket.

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OSCILLOSCOPE PM3243

Already published:
- OSC6, OSC10, OSC38 modifications to manual 9499 440 17102 for the PM3243 up to version 08.
- Manual 9499 443 00902 for the PM3243/08.
- OSC89, modifications to manual 9499 443 00902.
- OSC114, power supply modifications (TS1803).

Subjects:
1. Modifications to manual 9499 443 00902.
2. Y-attenuator modifications (R133, R104 and R116).
3. Power supply modifications.

1. Modifications to manual 9499 443 00902.

1.1. Mechanical parts top view (page 166).

Additional code numbers:
- Cast aluminium rear plate for all versions: 5322 447 94504.
- Cast aluminium front plate for all versions: 5322 459 84023.

1.2. Parts list (Resistors, page 179).

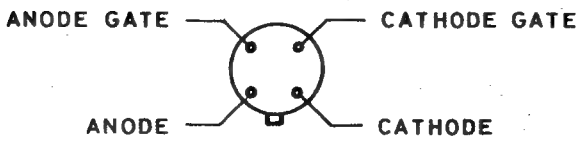
The ordering numbers of the following potentiometers must be changed into:

R1	5322 103 54027	5kΩ	2W
R2	5322 101 44015	50kΩ	

1.3. Component lay-out power supply (fig. 3.50).

The connections of TS1808 indicated in the p.c.b. drawing must be changed into:

TOP VIEW TS1808



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1.4. Circuit diagram power supply (fig. 3.52).

The position-number of the thyristor BRY39 must be changed from TS1801 into TS1808.

1.5. Survey of adjusting elements and checking procedure of the power supply.

In the "Survey of adjusting elements" (chapter 3.8.3, page 145) and in the checking procedure (page 149) of the power supply the + 15V output voltgae must be changed into + 12V output voltage (+ or —120mV).

2. Y-attenuators modifications.

- During production of the PM3243/09 the resistor R133 is changed to 86k6, ordering number 5322 116 54692, to improve the LF gain adjustment.
- The resistors R104, 88k9 MR24C and R116, 8k08 MR24C are obsolete and are replaced by:

R104	88k9	MPR24	5322 116 51466
R116	8k08	MPR24	5322 116 51465

3. Power supply modifications.

3.1. The ordering number of the NTC resistor R1851 (22Ω) is changed into 5322 116 30214.

3.2. Selected transistor pair BU126 (TS1803) is obsolete.
Transistor pair BU126 is replaced by a modification kit, which also improves the starting up of the power supply.
The kit that will be delivered under the same ordering number as transistor pair BU126, 5322 130 44406 consists of:

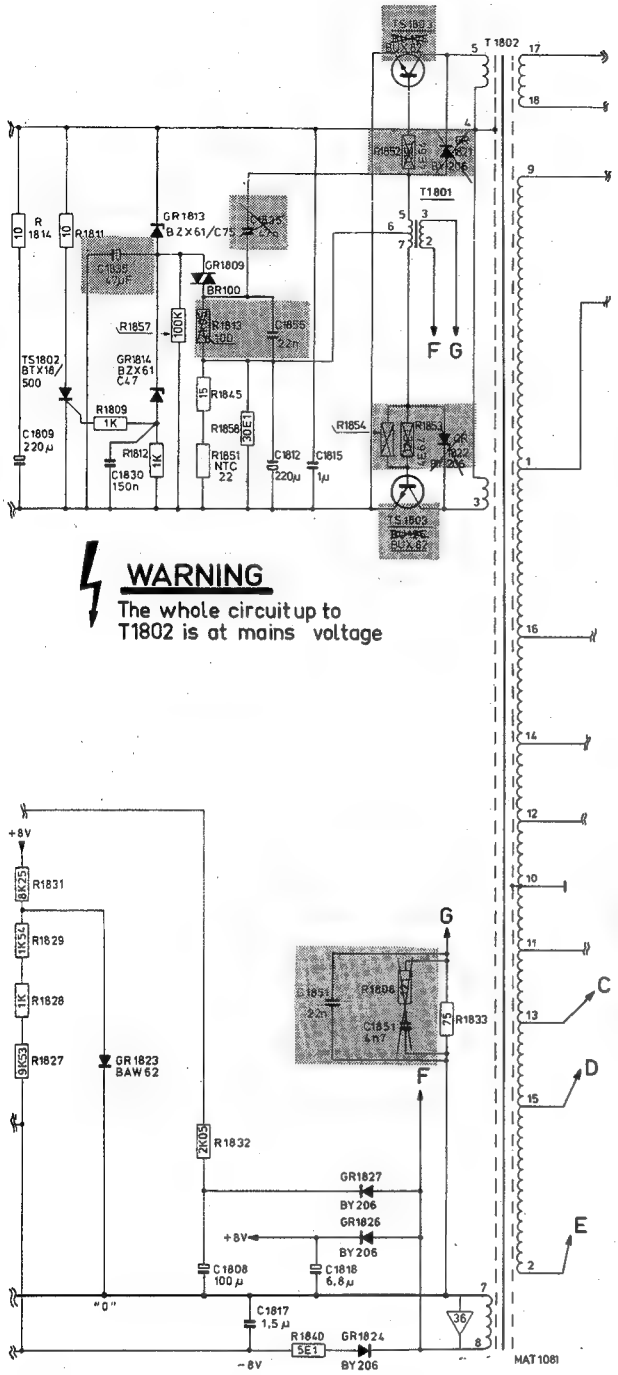
— 2 selected transistors	BUX82		TS1803
— electrolytic capacitor	47μF, 63V		C1835
— 2 ceramic capacitors	22NF		C1851 and C1855
— resistor	100Ω	MR25	R1813
— 2 resistors	4,64Ω	MR25	R1852 and R1853

— service information OSC114.

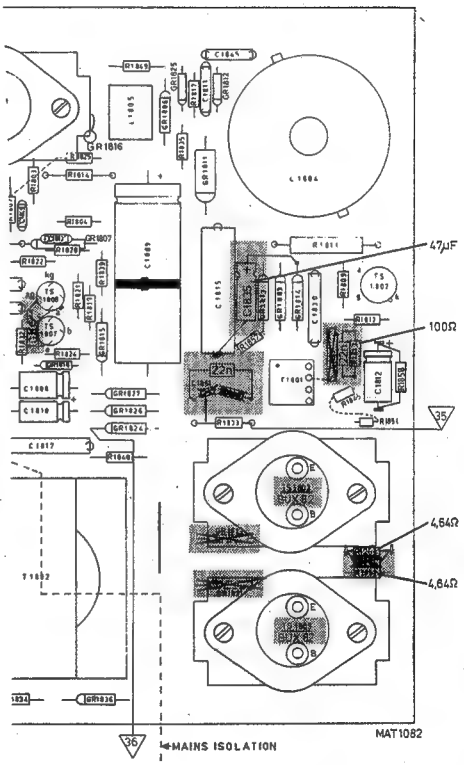
The following modifications must be made:

(see also the figures below).

1. Mount the selected transistors BUX82 (TS1803).
2. Remove capacitor C1835 (47NF).
3. Remove the diodes GR1821 and GR1822.
4. Resistor R1813 must be changed to 100Ω.
5. Remove resistor R1854.
6. The resistors R1852 and R1853 must be changed to 4,64Ω.
7. Remove resistor R1808 and capacitor C1851.
8. Mount a capacitor of 22NF (C1851) in parallel with R1833.
9. Mount a capacitor of 22NF (C1855) in parallel with R1813.
10. Mount an electrolytic capacitor of 47μF, 63V (C1835) between the cathode of GR1814 and C1815 (emitter of TS1803).



Part of modified circuit diagram



Part of modified printed circuit board.

3.3. The following important modifications must be carried out on all power supplies of the PM3243 that come into the workshop for repair or recalibration:

- To prevent that the power supply reacts too slow on a sudden short-circuit condition, the following modification must be made: remove capacitor C1860 and mount between anode and anode-gate of TS1808 (BRY39) a resistor of 10kΩ (MR25): 5322 116 54619.
- To improve the "switching series regulator" circuit the following modifications must be made:
  1. Remove diode GR1810 (BAX12).
  2. Replace the electrolytic capacitor C1810 (220µF) by a capacitor of 470NF, type nugget 100V ordering number: 5322 121 40175.
  3. Replace the resistor R1848 (511Ω) by a resistor with a value of 61,9Ω, type MR25, ordering number: 5322 116 54451.
  4. Mount in parallel with R1818 (82Ω) a resistor of 237Ω, type MR25, ordering number: 5322 116 50679.

Check the output voltages as follows:

Connect the instrument to the mains voltage and check the + 45V output voltage.
This output must be + 45V + or — 100mV; if necessary readjust R1828.

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Concerns: The 50 MHz Storage, Multiplier Oscilloscope PM3243.

Already published: OSC 38 for manual 9499 440 17102
OSC 57 for manual 9499 440 20302

Subject: Modifications to change the memory-off voltage from −36V to −48V.

This service information sheet will be packed together with a c.r.t. for the PM 3243, which needs a −48V memory-off voltage on the memory mesh G9.
In older instruments (up to PM 3243/05) this memory-off voltage is −36V.
See manual 9499 440 17102, fig. 3.31, SK20 point 3 (READ).
Starting with the PM 3243/05 this memory-off voltage is changed in −48V.
See manual 9499 443 00902, fig. 3.45, SK20 point 3 (READ).
To adapt an older instrument to a new c.r.t., which needs a memory-off voltage of −48V, the following modifications must be made:

1. Remove the variable persistence and storage unit as indicated in manual 9499 443 00902, section 3.4.6.
2. Interrupt the track (on the track-side of the p.w.b.) between point 3 of SK20B (READ) and the anode of GR2117 as indicated in fig. 1 (A)
3. Remove resistor R2197 (22k6)
4. Solder one side of a resistor of 20k5 (5322 116 55255) on the point, which is connected with C2117 as indicated in fig. 1 (B) (on the component side of the p.w.b.)
5. Solder between the resistor of 20k5 and the anode of the zenerdiode GR2117 a zenerdiode (GR2115) BZX 79 C12 (4822 130 34197). The cathode of GR2115 to the anode of GR2117 (see fig. 1)
6. Mount an interconnection wire between the anode of GR2115 (fig. 1 (C)) and point 3 of the switch SK20B (READ)
7. Mount the unit in the instrument.

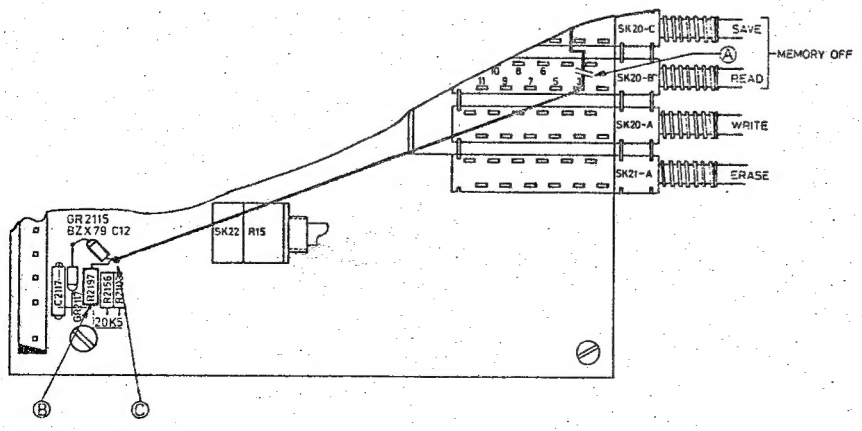

Fig. 1. Part of variable persistence and storage unit.

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800731 TEST AND MEASURING EQUIPMENT OSC 73

Concerns: The 50 MHz Storage, Multiplier Oscilloscope PM3243.

Already published: OSC 38 for manual 9499 440 17102
OSC 57 for manual 9499 440 20302

Subject: Modifications to change the memory-off voltage from −36V to −48V.

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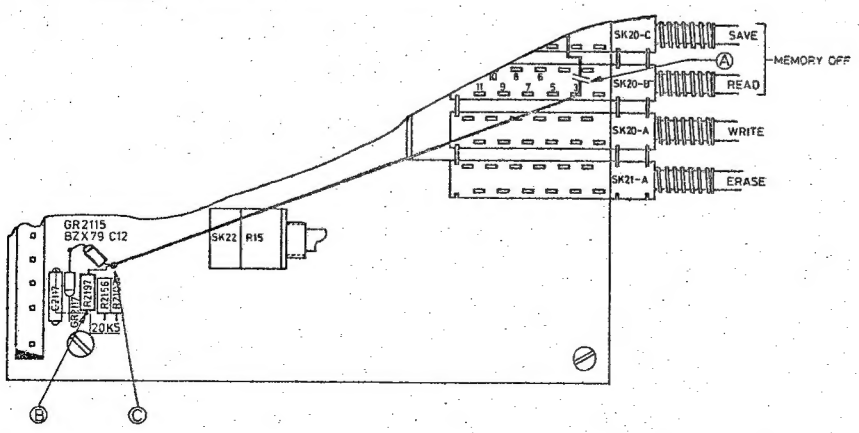

Fig. 1. Part of variable persistence and storage unit.

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800731 TEST AND MEASURING EQUIPMENT OSC 73

Concerns: The 50 MHz Storage, Multiplier Oscilloscope PM3243.

Already published: OSC 38 for manual 9499 440 17102
OSC 57 for manual 9499 440 20302

Subject: Modifications to change the memory-off voltage from –36V to –48V.

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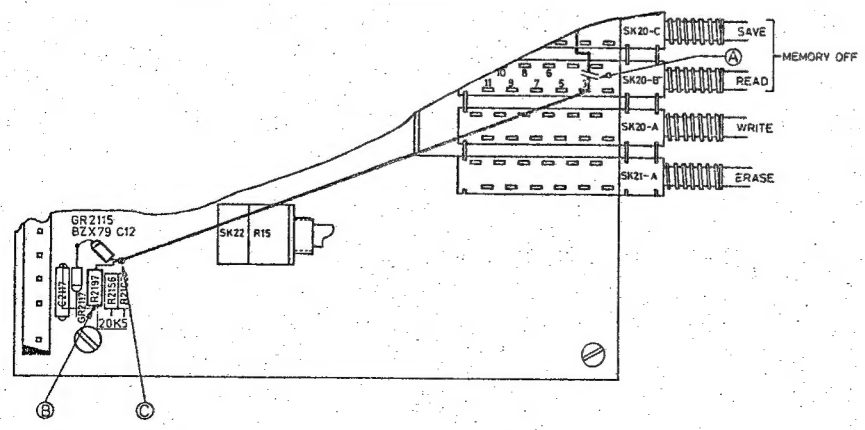

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